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 NOS: 20985

APPLICATION OF NGL WATER
SOLUTIONS PERMIAN, LLC
FOR APPROVAL OF SALTWATER
DISPOSAL WELL IN LEA COUNTY,
NEW MEXICO

REPORTER'S TRANSCRIPT OF PROCEEDINGS

EXAMINER HEARING

JANUARY 9, 2020

SANTA FE, NEW MEXICO

This matter came on for hearing before the New Mexico Oil Conservation Division, HEARING EXAMINER DYLAN COSS and LEGAL EXAMINER ERIC AMES, on Thursday, January 9, 2020, 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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A P P E A R A N C E S

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I N D E X

W I T N E S S E S

E X H I B I T   I N D E X

HEARING EXAMINER COSS: Okay. So we have moved through -- we only have one case left for today, and before we hear it, the Division is going to take a ten-minute break and we will reconvene at -- it's approximately 9:15 now, so we'll come back at 9:25.

(Recess taken.)

HEARING EXAMINER COSS: So we are going to go back on the record now, it's approaching 9:35, and I understand that the following case, 20985, is going to be presented by hearing with witnesses, so I'm going to read through our recently released guidelines for presentation of cases by witness.

So first off, the OCD Rules 19.15.4 NMAC, adjudication governing this hearing, the rules provide that the rules of evidence do not control, but may be used as guidance. 19.15.4.17(A) NMAC, the rules also provide that the hearing will not be conducted with rigid formality.

The parties are requested to respect the rules of evidence and exercise respect when making objections. Parties may present a brief opening statement describing the case and expected testimony. Please minimize legal argument to the extent necessary to orient the Hearing Examiner to the issues and do not argue the evidence. Parties must call each witness by name so that our court reporter can maintain a proper transcript.

After direct examination other parties may cross-examine, followed by a redirect. The Hearing Examiner then may ask questions the witness. The witness may be excused subject to recall for the purposes of presenting rebuttal testimony. Closing statements will not be allowed unless requested by the Hearing Examiner.

So at this point, with that being said, I would like to call for appearances in Case 20985.

MS. BENNETT: Good morning. Deana Bennett and Lance Hough from Modrall Sperling on behalf of the applicant, NGL Water Solutions Permian LLC.

MS. BADA: Cheryl Bada on behalf of the Oil Conservation Division.

HEARING EXAMINER COSS: Good morning, Cheryl.

Ms. Bennett, are you ready to proceed? Would you like to have an opening statement?

MS. BENNETT: I am ready to proceed. I would like to have a brief opening statement. But I also have four witnesses, and I'm not sure about the timing for swearing them in. Would you prefer to do that now, or after the opening statement?

HEARING EXAMINER COSS: Let's swear them in now.

(Oath administered.)

MS. BENNETT: Thank you. So this morning I will be presenting with both the hard copy and the screen, and for the record, I have already handed out copies of the materials to Mr. Goetze and his counsel. The materials that I will be presenting on the screen are a slightly -- are a truncated version of what is in the hard copies before you.

I tried to select the most appropriate and colorful slide for the screen, leaving out any materials that are too cumbersome to be easily digested on the screen, but I do have with me electronically the entire packet that you have before you, so if there are any slides that we gloss over during the presentation that you would like for us to discuss and have projected on the screen, I do have that capacity as well, technical capacity. Actual on-the-ground capacity will be determined.

I did want to point out that although this is -- our application is entitled an Application for Approval of a Saltwater Disposal Well in Lea County, what NGL is seeking here is approval for a shallow slurry injection well. So NGL's application was modeled on a prior application for a slurry injection well that was inartfully titled Saltwater Disposal Well, and I will endeavor to never repeat that again.

And the C-108 that we submitted also referred to a saltwater disposal well, but this is actually a shallow slurry injection well, as the testimony will demonstrate. And this is NGL's first application for a slurry injection well, and we have four witnesses with us; Chris Weyand, who prepared the C-108 and who worked on the C-108. It was prepared under his direction and supervision.

We also have Mr. Jessee, who works at Lonquist who is a geologist; Mr. Brian Davis, who is a petrophysicist, and he is an independent consultant, but he has worked on this project; and Mr. Peter Jordan, who is a reservoir engineer.

So we have four experts who will be testifying about various aspects of the slurry injection process, as well as the unlikelihood of any impacts on correlative rights, hydrocarbons or fracturing.

And so with that, I would like to call my first witness, if that's acceptable to you.

HEARING EXAMINER COSS: You may proceed.

MS. BENNETT: Thank you. At this time I would like to call Mr. Weyand.

CHRISTOPHER WEYAND

(Sworn, testified as follows:)

DIRECT EXAMINATION

BY MS. BENNETT:

Q. Good morning, Mr. Weyand.

A. Good morning.

Q. Please state your name for the record.

A. Christopher Weyand.

Q. And for whom do you work and in what capacity?
A. Lonquist Company, and I'm the staff engineer.
Q. Have you previously testified before the Division?
A. I have.
Q. And when was that?
A. That was in July of 2018.
Q. Were your credentials accepted as a matter of record?
A. They were.
Q. How long have you been -- you've worked on applications for NGL in the past, haven't you?
A. Yes, I have.
Q. About how many C-108s have you prepared for NGL?
A. About 35.
Q. Are you familiar with the C-108 in this matter?
A. I am.
MS. BENNETT: At this time I would like to tender Mr. Weyand as an expert in environmental engineering and permitting.
HEARING EXAMINER: Any objection?
MS. BADA: No objection.
HEARING EXAMINER COSS: So recognized.
MS. BENNETT: Thank you. Turning to the materials in front of you, the larger packet, the packet is

split into four different, four primary tabs, Tab 1 -- I'm sorry, five primary tabs. Tab 1 is the materials that Mr. Weyand will be going through. Tab 2 is Mr. Jessee's geology study. Tab 3, to orient everyone, is Mr. Davis' petrophysical study. Tab 4 is Dr. Jordan's reservoir engineering study, and Tab 5 is the notice materials. So we will be starting with Tab 1 now.

BY MS. BENNETT:

Q. And so turning to Tab 1, is the -- Tab 1 has five subsections, A, B, C, D and E. Is Tab 1-A the application that I submitted on behalf of NGL in this matter?

A. Yes. This is the hearing application.

Q. And behind Tab 1-A is the C-108 that you prepared?

A. Yes, that's correct.

Q. What is NGL seeking under this application?

A. They are seeking approval of a slurry injection well into the Delaware Mountain Group, requesting a maximum rate of 20,000 barrels per day. On average they expect to inject roughly 6000 barrels per day.

Q. Great. Do you know if NGL has any other slurry injection wells that operate outside of New Mexico?

A. They do. They have -- they've been operating slurry injection wells since 2014. They have seven active wells in Texas, one in Colorado. Their nearest is operation is Orla, Texas.

Q. We will be talking more about the Orla facility later today, right, with the water sampling that you did?

A. That's correct.

Q. Okay. Are you familiar with the process that NGL proposes to use for slurry injection at this facility, at Striker 4?

A. Yes, I am.

Q. Can you briefly describe that process for the Examiners?

A. Sure. So in the area we have active drilling operations going on. Some operators who are actively operating in the area, Chevron, Concho, Marathon, Centennial, and so once they complete their drilling operations, they may have liquid waste that needs to be disposed of. This would be wrecker-exempt, non-hazardous waste, mostly drilling mud from those drilling operations.

So that would be first, you know, during those drilling operations, that mud would be, would be screened. There would be a solids-control system out there filtering out large solids. That would then be trucked to the slurry injection well facility.

And at the facility it would be visually observed and tested and then sent to, sent from the trucks to the shaker system where it's run across a 200 mesh screen. If they needed to thin out the mud if it was too thick, it would be mixed with produced water from the area.

And then your, your light slurry falls through the shaker system, which is very similar to what you have at a drilling location, and your solids would then roll off, and those solids would then be transported to an approved landfill in the area.

In this case, NGL is seeking approval of a landfill, their North Ranch facility, which is about four miles from this location, and then the light, that light slurry would then be sent downstream to the injection well and pumped downhole.

Typically then it's -- that well would be flushed with produced water after injection of that slurry.

Q. And so a moment ago you testified that the slurry or the -- at the oil well itself, the mud would already have gone through a screening process before it ever gets on a truck to go to NGL. Is that right?

A. That's correct.

Q. And a minute ago you talk the about flushing the wellbore with produced water. What's the importance of flushing the well with produced water after you've injected the slurry?

A. Sure. I mean, you have, ultimately you've got solids there in the slurry. Most of it would be filtered out, but in an effort to clean that near wellbore area.

Q. Is that sort of a proactive approach to keep the wellbore clean?

A. That's correct.

Q. And about how many barrels would you need to flush in order to clean out a -- the wellbore after -- during an injection process?

A. Sure. At some of NGL's other facilities they use 2000 barrels to flush the wellbore?

Q. So as I understand your testimony, the slurry would be injected, the spinner slurry would be injected, and then it would be followed by a flush of produced water to clean out the wellbore.

A. That's correct.

Q. A moment ago I believe you testified that the drilling mud would come to the NGL proposed site by truck. How will the produced water be transported to NGL's Striker 4 location?

A. It may come in either by truck or by pipeline.

Q. The produced water will be used to flush the wellbore, but will produced water also be used -- I think you testified about this -- if the slurry or mud arrives is too thick?

A. That's correct. It would be used to thin out that mud to run across the shaker system.

Q. And are there -- so has Mr. Neel Duncan prepared an affidavit for this case?
A. Yes, he has.
Q. And is that behind Tab B, 1-B at Page 25?
A. That is, yes.
Q. And do you know if Mr. Duncan went to -- well, in his affidavit he testified that he went to NGL's Colorado facility and took some photos; right?
A. That's correct.
Q. So let's take a minute and run through some of the photos Mr. Duncan took. And so this is the first -- one of the photos that I put in the pack of materials, right, and what is this photo?
A. This shows a truck --
Q. Go ahead.
A. This shows a truck showing up at the facility. They have been hooked up to offload the drilling fluids, and then that would be pumped to a -- to the shaker system.
Q. And so the drilling fluids go directly from the truck to the shaker system, generally speaking?
A. Generally, yes.
Q. You mentioned earlier that there is -- and I apologize, these photos got a little out of order, but we will work through them the best that we can. But you mentioned earlier there is some testing done; right? Is

this an example of the testing equipment?
A. That's correct.
Q. And what's the testing for?
A. They are testing for pH and to confirm what the fluids actually are, make sure it's something that would be acceptable at the location.
Q. And if either the visual test or the calibration test --
A. Uh-huh.
Q. -- came back in a way that was concerning, what would NGL do?
A. Those trucks would likely be sent to another disposal facility or possibly their landfill.
Q. But it wouldn't be accepted at the slurry injection plant?
A. That's correct. That's correct.
Q. Why don't you talk about it.
A. It's just piping at the facility. This would be one of their storage tanks, pretty similar setup to a standard saltwater disposal facility except for the shaker system. This would be a larger solid filtration component, not the 200 mesh screen, but a larger screen there.
Q. This is part of the testing program; right?
A. That's correct. So this is, right here we have one line that's headed to the injection well that would be

carrying the slurry. And then this other line that comes in would be carrying produced water, and so that would be used for the flushing of the wellbore after the slurry is pumped.

Q. So the slurry that would be going through the more parallel pipe would have been thinned out if need be by produced water?

A. That's correct.

Q. And then it would go downhole and followed by a flush of produced water?

A. That's correct.

Q. I'm going to try something since we all are here at the moment and see if I can get a video to play.

A. So here we have the, you know, the drilling fluids coming in, and we run across the shaker system, and the solids entertained on top, and the light slurry filtering down through.

Q. And so it's sort of like a micro vibration that causes the shaker system to work?

A. Yeah, that assists with the filtration process.

Q. Great. Thanks. Do you have a schematic of what the Striker 4 facility would look like?

A. Yes. We have a -- yes, we have a conceptual design that is included as an exhibit.

Q. Is it the conceptual design?

A. Yes.

Q. Does it show generally some of the components that we just talked about?

A. Yes. On the top there you have got two truck lanes coming in. And then bottom, at the bottom there's more of your typical injection facility with batteries and separators and your shaker system.

Q. Great. Thank you. A moment ago we talked about how this material would -- this waste would arrive to the Striker 4 facility by truck; is that right?

A. That's correct.

Q. About how many trucks do you think there would be per day?

A. We would expect 50 to 125 trucks or so per day.

Q. And are they -- will this be new truck traffic or truck traffic already on the road?

A. It's truck traffic already on the road.

Q. Is there infrastructure near the Striker 4 facility that is in existence?

A. It is. It's right off Highway 128, and that would facilitate truck traffic coming in and out of the facility.

Q. There is no need to construct any additional roads?

A. That's correct.

Q. What's the status of the land on which NGL

proposes to construct this slurry injection facility?

A. It is owned by NGL.

Q. And you mentioned already that the solids would go to a landfill?

A. That's correct.

Q. And the landfill that NGL is proposing for the moment is the -- or proposing to use is the North Ranch Landfill?

A. That's correct.

Q. And NGL has already prepared an application for that landfill?

A. Yes, it has.

Q. What are some of the advantages in your opinion of using -- of having a slurry injection facility?

A. Sure. So I think it comes down to the efficiency of the process, the efficiency of the injection. You are able to take this waste that needs to be disposed of and inject it downhole into -- or the majority of it downhole into a confined injection interval that is, you know, you have confining intervals that protect it from USDWs and from reaching oil and gas bearing zones, and ultimately it results in much less surface impact because rather than these liquid wastes needing to be taken to a landfill and bulked up, dried up with what may be resources such as topsoil to get that to a point where it's been diluted to the point that the landfill can accept it, you have, you know, most of that going downhole and very little of it headed to the landfill, so you are able to preserve those resources and also preserve space in the landfill for future disposal that, you know, it, it would be more necessary for.

Q. So the injection of the slurry into the pour space actually reduces the amount of waste that's taken to a landfill?

A. Yes, that's correct. Something else I would add is just that having another disposal option in this area would, in general, hopefully reduce truck traffic.

Q. And I think, earlier we talked about produced water being used to flush the pipes or the wellbore. What would be the other option to flush a wellbore? Would it be fresh water?

A. Yes, yeah. So if you are going to flush it, I mean, I think that you're -- you would rather use an existing waste stream to flush it rather than some sort of resource such as fresh water.

Q. A moment ago you talked about needing to bulk up liquid waste that's taken to a landfill. What does that mean, to bulk up liquid waste?

A. It's drying it out so that the landfill can accept it and diluting that, that waste stream to the point that, that it meets the landfill's criteria.

Q. So it could be that if it's, in very simple terms, if you took a gallon of liquid waste --

A. Sure.

Q. -- to the landfill, that could mean three to -- or more, five -- I'm just guessing here -- but more gallons --

A. That's correct.

Q. -- of dry waste?

A. Yes.

Q. So I wanted to talk about the C-108 now. You supervised the preparation of the C-108; right?

A. That's correct. I supervised it.

Q. And you signed the C-108?

A. Yes, and finalized its assembly and signed it, yes.

Q. That's your signature that's on Page 4 of the materials --

A. That is correct.

Q. -- behind Tab 1-A? And you provided me with some updated materials in advance of the hearing; right?

A. I did.

Q. And let's turn to Tab 1, 1-C -- D, please, and that starts at Page 35 of the materials. Is one of the updated items that you provided to me a revised wellbore?

A. Yes, that's correct. We lowered the top of the proposed injection interval based off of refined geology which Mr. Parker Jessee will go into more detail about.

Q. This Exhibit 1-D on Page 35, which is also on the screen, that shows the revision to the injection interval?

A. That is correct.

Q. And then looking at the next page, which is Page 36, is this a revised or more refined slide than what was in the original C-108?

A. That's correct. It's a more detailed half mile AOR. In general it shows the laterals there.

Q. Okay. The final updated slide that you gave me -- well, not the final one, the penultimate, or whatever that word is -- the next slide is Page 37, and what is this slide?

A. It is our original two-mile area of review that we expanded to 2.25 miles. There was a data point that we wanted to include, that Mr. Brian Davis wanted to include in his petrophysical analysis, so for that reason, we expanded it. There is also some annotations on here that are pertinent to the application.

Q. One of the things we talked about when we were preparing the -- preparing yesterday was that this shows the -- DMG risk area. What is the DMG risk area?

A. It is an area that's been identified by the OCD as over-pressured interval or area of the Delaware Mountain

Group.

Q. And so you've identified that on the map?

A. That's correct. So that was a data layer that we took from OCD.

Q. Thank you. And as you noted, there are annotations you put on here about, for example, some dry holes in the area?

A. That's correct. So we reviewed well records within the AOR and identified dry holes not only in the Delaware Mountain Group, but also wells that would have penetrated or that would have penetrated the Delaware Mountain Group that ultimately tested other formations, but thought there was some value in knowing that they penetrated the Delaware, but never tested it.

Q. Are there any active injectors into the Delaware Mountain Group in the two-mile area of review?

A. No, there are not.

Q. Are there any proposed slurry injection operations within the two-mile area of review?

A. Yes. The proposed -- Milestone's Beaza SWD is shown on this map.

Q. Great, thank you. A moment ago we talked about the change in the formation top that Mr. Jessee is going to talk about a little bit more in detail?

A. That's correct.

Q. In the C-108 application that I filed on behalf of NGL, NGL requested specific psi based on the prior understanding of the injection interval; is that right?

A. That's correct.

Q. What was the psi that NGL requested?

A. It was a max pressure of 1087 psi, and an average pressure of 815 psi.

Q. Would the change to the top of the formation interval affect the psi?

A. Yes, it would.

Q. And in what way?

A. It would -- the fact that we're dropping the top of the interval and the .25 psi per foot, that would increase it. So we would like the option to, based off of the as-drilled encountered tops of the formation, reserve the right to, I guess, amend that psi, receive a higher psi based off the encountered geology after drilling the well.

Q. Thank you. Did you identify the parties entitled to notice?

A. I did.

Q. And how did you -- what was your first step in determining to whom notice should be provided?

A. I researched active operators in the area based off the OCD records, and we knew that NGL was a surface landowner in this case, so the operator was the landowner.

In cases where there wasn't an active operator, we identified the lessee of record, and the BLM also had some interest within the AOR and were put on the notice list.

Q. So you followed OCD's regulations for whom notice is required today?

A. Yes.

Q. And you did you provide that list of parties to whom notice is required to me?

A. I did.

Q. Let's look at Page -- well, you conducted some analysis of compatibility of the injection waters with the injection -- the waters that are currently in the injection interval; is that right?

A. That's correct. I reviewed analysis from the New Mexico's GoTech site, so publicly available data on produced waters from the Delaware Mountain Group, and compared that with data from NGL's Striker 6 location. So we collected a produced water sample off of that facility that's currently in operation as kind of what would be representative of produced water coming into the Striker 4 facility for either dilution or for flushing the wellbore.

And then also we collected analysis -- or collected a sample and performed analysis on their nearest operation in Orla, an example slurry injectate. And just in general, the samples were sodium chloride water, and we wouldn't expect any compatibility issues.

Q. Let's just break that up into two parts. When you said you looked at sampling from Striker 6, NGL Striker 6, that's in New Mexico; right?

A. That's in New Mexico.

Q. And it's a deep SWD?

A. It is. It's a Devonian SWD.

Q. And then you also looked at samplings from the Orla facility, which is in Texas.

A. That's correct, NGL's Orla slurry injection well facility.

Q. Is the injection facility in Orla injecting into the same formation as proposed here?

A. It is.

Q. So by comparing the injectate or what is being injected in Orla to the water that's being injected into, is that, in your opinion, is that a fair comparison to what NGL is seeking here?

A. Yes, it's very similar.

Q. And you concluded that there were no compatibility issues?

A. That's correct.

MS. BENNETT: So last night we received some sampling information that is unfortunately very small to read. It looks like this, but I'm happy to either admit this or we can try to make it larger for you all for the actual packet, but for the moment I will just pass it around and we can decide if we are going to use it as an exhibit after we -- after Mr. Lance has had a chance to look at it, if that's all right with the parties, but we do have copies for everyone.

BY MS. BENNETT:

Q. Mr. Weyand, what is this, if you can tell?

A. This is the complete water analysis performed on the injectate sample gathered at NGL's Orla facility.

Q. So this is the last data from the Orla facility?

A. Right, on their slurry -- on the sample slurry injectate.

Q. And this is what you reviewed to make your -- to reach your conclusion that there would not be any compatibility issue?

A. Yes, that's correct. In general, lower and comparable TDS fairly clean compared to even some of the former -- native reservoir formation waters.

MS. BENNETT: So at this time I would like the ability to try to manipulate this a bit better to make it into something more legible for the Division rather than admitting this as an exhibit now, but I did want to identify it as the basis for Mr. Weyand's testimony.

MR. AMES: How do you expect it to enter the record then if you are not going to move for its admission?

MS. BENNETT: I will -- can I move for its admission and supplement the record with a more legible version after the hearing?

MR. AMES: Are you moving for admission?

MS. BENNETT: I will move for the admission of Mr. Weyand's exhibits altogether, so, yes, I will be moving for the admission of this.

MS. BADA: No objection.

HEARING EXAMINER COSS: When you submit the additional information, you will send us a package received from the laboratory with all the QC and everything like that?

THE WITNESS: Yes, that's correct.

HEARING EXAMINER: Okay. Well, in that case, the exhibit will be admitted subject to the additional information we requested. If you could provide what the laboratory sent you and clean up this one, get it cleaned up.

MS. BENNETT: Great. So for the moment, I would like to -- I will be adding it to supplemental material behind Tab 1-D, just for the record, and we will mark it as Page 40-A, 40-A because I have already numbered the pages, and I don't want to mess up the hearing transcript pages.

HEARING EXAMINER COSS: Okay.

MS. BENNETT: Thank you. Again I will move for the admission of all the exhibits of Mr. Weyand's exhibits at the end as well.

BY MS. BENNETT:

Q. Mr. Weyand, when you were preparing for the hearing today, and when you were preparing the -- or considering the application, did you assess any risk of seismicity in the area?

A. I did. I reviewed seismic events within 5.6 miles of the proposed Striker 4 location using USGS seismic event search.

Q. And if we look at Tab 1-E, which starts on Page 41, does this show the parameters that you put in from the USGS monitoring catalogue?

A. Yes, that's correct.

Q. And why did you choose 5.6 miles?

A. That's 100 square miles around the wellbore and consistent with what was done in Texas.

Q. Is that consistent with what other experts have testified to for NGL?

A. Yes, that's correct.

Q. And what were the results of your search again?

A. There were no seismic events with magnitude of 2.0 or greater within the area.

Q. And does NGL have a seismic monitoring system

that it puts at all of its wells that it operates?

A. Yes, they do.

Q. Great, thank you.

A. I guess one thing, if I could add to that.

Q. Please do.

A. We also reviewed any faulting in the area, and Mr. Jessee will go into more detail, but we didn't note any shallow faults in this area cutting the lower confining or through the injection interval.

Q. Thank you.

MS. BENNETT: With that, I would like to move the admission of Exhibit 1 and it's attachments.

HEARING EXAMINER COSS: Any objection?

MS. BADA: No objection.

HEARING EXAMINER COSS: Exhibit 1 is so admitted with the exceptions.

(Exhibit 1 admitted.)

MS. BENNETT: Thank you.

MR. HOUGH: I'm just going to add a label for that one.

HEARING EXAMINER COSS: Appreciate it.

MS. BENNETT: And with that, I pass the witness.

MS. BADA: I just have a couple of questions.

CROSS-EXAMINATION

BY MS. BADA:

Q. You mentioned that you would potentially flush the wellbore with produced water?

A. Yes, ma'am.

Q. Where would you be obtaining that produced water?

A. It would be from production operations in the area, so water that would already be headed to other disposal wells currently.

Q. Are any of the disposal water from the Striker 6 SWD?

A. That's possible.

MS. BADA: That's all I have.

HEARING EXAMINER COSS: Wonderful, thank you. So my first question straight away is, could you re-explain to me how -- oh, is there any redirect?

MS. BENNETT: No.

HEARING EXAMINER: Okay. I guess it caught me off guard that you are going to be injecting mud, per se, and this is going to be describing the mineralogy or the composition of the mud. But could you go into greater detail about why you think this injection material will be compatible with the Delaware Mountain Group?

THE WITNESS: Sure. In general, the concentration of sodium chloride is comparable to the formation waters in the area that we were able to pull data on, and, you know, there is no significant amounts of other concerning gases such as CO2 or H2S, anything that would be concerning as far as injecting into the injection formation, or at least in quantities that would be concerning

HEARING EXAMINER COSS: So there is no -- the sodium chloride content is similar to other produced water, but what is the composition of the mud? Should we be worried about the composition of the mud being compatible with the formation?

THE WITNESS: That's something definitely to take into consideration, and it's -- it's something that I think the best proof of concept is the Orla facility and the fact that there hasn't been any compatibility issues there.

HEARING EXAMINER COSS: What's the injection interval at the Orla facility?

THE WITNESS: The Delaware Mountain Group.

HEARING EXAMINER COSS: The Delaware Mountain Group, is it the same interval in the Delaware Mountain Group?

THE WITNESS: Yes.

HEARING EXAMINER COSS: Do you have reason to believe that the composition of the formation is the same as like the Delaware Mountain Group or should be comparable? I know that should be a lot more distal than we are here.

THE WITNESS: Sure. Based off the data we have in the area near Striker 4, we saw some varying results on water analysis. And so it's kind of broad, and we feel that the formation in the area of Orla would fall within what we would expect in the Striker 4 area.

HEARING EXAMINER COSS: I see. And then TDS what's the total dissolved solids for typical produced water and water you intend to inject? Do you foresee any problems with that? I see 7,565 here.

THE WITNESS: Yes, this sample of TDS is about 75,000 milligrams per liter. The data that we pulled off GoTech ranged from 50 to 75 or so upwards of several hundred thousand milligrams per liter as far as TDS is concerned.

HEARING EXAMINER COSS: I see. How long has the Orla well been in operation?

THE WITNESS: Since 2014.

HEARING EXAMINER COSS: 2014, okay. And have you done any studies conducted on injecting the mud into the interval changes? That's not an issue here, it's the same fluid, but have you retested it gumming up the formation away from the wellbore?

THE WITNESS: I can't answer that question. I need to discuss it with my client.

HEARING EXAMINER COSS: Okay.

THE WITNESS: I do know that in some cases they have to, you know, they have to clean out wells. And I don't know if that's been the case at Orla in particular, and that in general you are using the screening mechanism to filter out as much solids as possible.

HEARING EXAMINER COSS: Sure. So kind of moving on from this line of questioning, how many wells -- does this list of wells in the AOR include -- does it identify for me wells that penetrate the injection interval?

THE WITNESS: Yes, sir.

HEARING EXAMINER COSS: And was there any analysis done to ensure all of these wells are properly cemented, and does it indicate which ones have been P and A'd, and will you provide -- do you have all of the information on the P and A'd wells or something to ease our minds when I have to do the review --

THE WITNESS: Absolutely.

HEARING EXAMINER COSS: -- I have to check for?

THE WITNESS: Within the half mile AOR, I reviewed all wellbores that penetrate the injection interval. There aren't any plugged wells. There are only shale wells that have been drilled recently, and all of them have been submitted across the injection interval.

HEARING EXAMINER COSS: Perfect. And so in Exhibit -- do I take it that Exhibit 5 is where the notice --

MS. BENNETT: Yes, and I will be providing more information about the notice.

HEARING EXAMINER COSS: Perfect. At this point those are all my questions.

THE WITNESS: Thank you.

HEARING EXAMINER COSS: And Eric will proceed then.

MR. AMES: Good morning.

HEARING EXAMINER COSS: Good morning.

MR. AMES: I have a couple of questions here. The application says NGL seeks authority to inject saltwater, but you are also injecting slurry or mud; is that right?

THE WITNESS: Yes, sir, Class 2. It would still qualify under Class 2 disposal. Yes, sir.

MR. AMES: So what's in this mud or slurry?

THE WITNESS: There would be drilling fluids, it -- based off of our analysis here, I mean it is very comparable to produced saltwater.

MR. AMES: Okay.

THE WITNESS: And we filtered out the solids that ultimately what we are injecting downhole is comparable to produced water in the area, and it's also being mixed with -- you know, the mud is being mixed with produced water, and then those solids are being taken elsewhere.

HEARING EXAMINER COSS: Question -- quick question. What kind of grain size are we talking about in the mud? How big are the molecules or the mud solids?

THE WITNESS: That are being filtered out?

HEARING EXAMINER COSS: Well, not that are being filtered out, that are being injected down.

THE WITNESS: Anything that passes through a 200 mesh screen, so I think that's roughly 60 microns or so.

MR. AMES: So you are injecting the produced water and any particles that are less than the screen size; is that right?

THE WITNESS: That's correct.

MR. AMES: So on Page 29 of the exhibits there's a picture that you used that was flashed on the screen that showed a green meter. And you said that you are testing the fluid to determine what is being injected.

THE WITNESS: Yes, sir.

MR. AMES: The only characteristic I heard mentioned was pH. So what else is being tested?

THE WITNESS: I don't believe there is any other tests done. There is a visual assessment that takes place to ensure that it's not cement or something that could damage the wellbore.

MR. AMES: Okay. So when you said that you are testing the fluid to determine what is being injected, in fact, you were not actually determining what is being injected in terms of what chemical constituents are being injected; is that right?

THE WITNESS: That's correct. There would be, in this case we gathered a sample and so we are able to assess that, and I would assume that that's done in other cases as well, but not on a -- we are not running a complete analysis on a -- with every truckload that's coming in.

MR. AMES: So in fact the only characteristic you're actually testing for in the injectate is pH?

THE WITNESS: Yes, sir.

MR. AMES: You don't actually know what's in there; is that right?

THE WITNESS: That would be correct.

MR. AMES: So I'm not suggesting that's wrong under the rules, I'm just trying to find out -- clarify your statement.

THE WITNESS: Yes, sir.

MR. AMES: You said you are flushing the wellbore, you would be flushing this wellbore; is that correct?

THE WITNESS: Yes, sir, that would be correct.

MR. AMES: And you said 2000 barrels you would be using, the quantity?

THE WITNESS: That's what I would expect based off of operations at other facilities.

MR. AMES: How frequently?

THE WITNESS: After each slurry injection -- each slurry is pumped, so you know, we may pump several hundred or thousand barrels of slurry and then follow that with the 2000 barrels of produced water.

MR. AMES: Is that -- do you anticipate that to be a daily practice?

THE WITNESS: Yes, sir.

MR. AMES: More than once per day?

THE WITNESS: I would assume so. I don't -- I don't know in particular.

MR. AMES: So you don't know how frequently you are going to have to flush the wellbore on a daily basis?

THE WITNESS: Well, it would depend on the rates coming into the facility.

MR. AMES: What do you anticipate?

THE WITNESS: We would anticipate that, yes, we would need to flush the wellbore multiple times per day.

MR. AMES: Multiple times?

THE WITNESS: Yes.

MR. AMES: More than ten.

THE WITNESS: No, sir.

MR. AMES: More than five?

THE WITNESS: Possibly.

MR. AMES: So somewhere between five and ten times a day you would have to flush the wellbore?

THE WITNESS: That seems reasonable. Ten would be high. That would mean, if we use the same practices, that would mean 20,000 barrels, and that's already at the maximum rate without any, any of the slurry, so --

MR. AMES: So it sounds like between 10- and 20,000 barrels per day of flushing would have to occur and you would have to back that out against the daily injection rate?

THE WITNESS: Probably closer to the 10,000 number on a high day, yes, sir.

MR. AMES: Okay. Did you all do a plume dispersion model for this one?

THE WITNESS: Yes, sir, we did.

MR. AMES: You didn't testify about it. Is someone else going to testify about it?

THE WITNESS: Yes, sir.

MR. AMES: Is that the reservoir engineer?

THE WITNESS: Yes, sir.

MR. AMES: Okay, thanks. Just one minor point. You suggested that this well will have the potential benefit of reducing truck traffic in the area.

THE WITNESS: Yes, sir.

MR. AMES: Is there any calculations on that impact?

THE WITNESS: No, sir.

MR. AMES: So it might, but you don't really know?

THE WITNESS: That's correct.

MR. AMES: I just wanted to clarify that. Thank you.

THE WITNESS: Thank you.

HEARING EXAMINER COSS: I guess it just, this has the -- all the kind of elements broken out into molecules on this and that on the chemical analysis, but what is the typical kind of composition of the drilling then? Should we be concerned about swelling clays in the drilling mud or different types of clay?

THE WITNESS: I know that some drilling fluids would be fresh-water based. I'm not sure about the swelling of clays.

HEARING EXAMINER COSS: Okay. That's all my questions.

THE WITNESS: Thank you.

MS. BENNETT: May I ask a few questions on redirect?

HEARING EXAMINER COSS: Yes, of course, Ms. Bennett, subject to recross and keep the questions within the scope of our line of questions.

MS. BENNETT: I will. Thank you very much.

REDIRECT EXAMINATION

BY MS. BENNETT:

Q. A moment ago you were asked by one of the examiners about the Delaware Mountain Group formation near the Orla well?

A. Yes.

Q. Whether you would anticipate it might be the same as the formation for Striker 4?

A. Yes.

Q. About how far from Striker 4 is the Orla well?

A. I'm not sure.

Q. Okay. Is the -- a moment ago you were asked about the content of the mud and what sort of tests you do to the mud. This, for everyone's benefit, this is mud that would be being produced no matter what; right?

A. That's correct.

Q. And if it weren't being slurried through a process like this, it would go into a landfill?

A. That's correct.

Q. And is the mud a natural by-product or a by-product of an oil and gas operation?

A. Yes. It would be a waste stream from the oil and gas operation.

Q. And the composition of the mud, it would include pieces of rock and other materials that were being generated as the well is being drilled?

A. Yes, that's correct.

Q. And if it were not being injected, then regardless of what the chemical composition is or the capacity, it would be going to a landfill?

A. That's correct.

Q. A moment ago you were asked about the number -- about how many times a day do you think this operation would need to flush the pipes.

A. Uh-huh.

Q. And I think your answer was that it would depend upon the market, the amount of waste that you received?

A. That's correct.

Q. And you were also, you also mentioned the GoTech data about the TDS?

A. Yes.

Q. And that GoTech data is in the application material you submitted; right?

A. That's correct.

Q. And you looked at that in relation -- that's the data that you were able to obtain that tells you what the TDS in the receiving water --

A. In the formation --

Q. In the formation --

A. -- water, yes, native formation water.

Q. And TDS that you saw in the GoTech data was

actually higher than the TDS in some cases that NGL --

A. In some cases, yes.

Q. Okay. Those are the only follow-up questions I had. Thank you.

A. Thanks.

MS. BADA: No recross.

HEARING EXAMINER COSS: Well, you may be excused then, Mr. Weyand.

THE WITNESS: Thank you.

MS. BENNETT: Thank you.

At this time I would like to call my second witness, Mr. Parker Jessee.

PARKER JESSEE

(Sworn, testified as follows:)

DIRECT EXAMINATION

By MS. BENNETT:

Q. Good morning, Mr. Jessee.

A. Good morning.

Q. Will you please state your name for the record?

A. Parker Jessee.

Q. And for whom do you work?

A. Lonquist.

Q. And in what capacity?

A. Petroleum geologist.

Q. Have you previously testified before the

Division?

A. Yes, I have.

Q. Were your credentials as an expert in petroleum geology accepted as a matter of record?

A. Yes, they were.

Q. When did you previously testify before the Division most recently?

A. Back in August 4, the Milestone Beaza Well.

Q. Is the Milestone Beaza Well also a slurry injection well?

A. Yes, it is.

Q. Does it follow approximately the same model as this NGL well?

A. Yes, it does.

Q. So in that case, like this case, Milestone is proposing to inject a slurry?

A. Yes.

Q. And you did the geology study for that case as well?

A. Yes.

Q. Are you familiar with NGL's application that is submitted in this case?

A. Yes, I am.

Q. Did you prepare a geology study for this case?

A. Yes, I did.

MS. BENNETT: At this time I would like to tender Mr. Jessee as an expert in petroleum geology.

MS. BADA: No objection.

HEARING EXAMINER COSS: So recognized.

MS. BENNETT: Thank you.

BY MS. BENNETT:

Q. What was your role with respect to the preparation of the C-108? Did you have any role in the preparation of the C-108?

A. Not particularly with the C-108.

Q. How about in advance of this hearing, did you prepare a geology study in advance of the hearing?

A. Yes, I did.

Q. In your work for preparing the geology study for the hearing, did you review data from a number of offsetting wells?

A. Yes.

Q. And based on your review of the cross-sections and structure maps that we will get into a little bit further in the testimony, did you you change the predicted -- or did you reach a different conclusion or conclusion about the predicted top of the formation?

A. Yes, I did, with the additional of some more control wells in the area, it adjusted our estimated structure at the top of the injection interval by roughly around 50 feet.

Q. Okay. And is that additional change reflected on the wellbore diagram --

A. Yes.

Q. -- that we talked about earlier?

A. Yes, it is.

Q. Did you prepare a locator map to show where this well is proposed to be located?

A. Yes, I did.

Q. And is that -- well, your exhibits are behind Tab 2, is that right, of the materials?

A. Yes, they are.

Q. And is the locator map Page 43 of the materials?

A. Yes, they are -- yes, it is.

Q. And that's on the screen, too.

A. Yes.

Q. And so this shows the location of the proposed Striker 4 Well in the general basin area?

A. Yes, it is.

Q. Okay. And then let's turn to the next page which is Page 44. Is Page 44 an overview chart showing the various formations for the Hearing Examiners?

A. Yes, it is.

Q. Does this chart show the formations in which NGL is proposing to inject?

A. Yes, it does.

Q. What formations are those?

A. The Bell Canyon and Upper Cherry Canyon.

Q. And then does this -- does this slide also show a confining layer above the target injection interval?

A. Yes, it does. The Salado -- that is representing the Salado and Castile anhydrite and salt, and then also the lower confining zone being the Brushy and Lower Cherry.

Q. So there is an upper confining layer between the injection interval and fresh water resources, and a lower confining area between the injection interval and hydrocarbons --

A. Yes, there is.

Q. -- potential hydrocarbons? Okay. Okay. Let's talk a little bit more specifically about your geology study now. So the first four pages of the materials in the packet are structure maps that you prepared for each of the formations we are going to talk about today; right?

A. Yes.

Q. So what are the formations that we are going to be talking about?

A. I created structure maps for the Bell Canyon, Cherry Canyon, Brushy Canyon and Bone Spring.

Q. Great. And is this, what's the contour interval that you used for your map?

A. 50.
Q. And you used that contour interval for all four structure maps?
A. Yes, I did.
Q. And I'm talking about all four structure maps here. Did you see any evidence of faults in any of the structure maps?
A. No.
Q. Any pinchouts?
A. No.
MS. BENNETT: So for the Hearing Examiners' benefit, all four structure maps are included in the hard copy of the materials, but for purposes of the screen presentation I've only included one of the structure maps, which is the structure map for the Bell Canyon.
BY MS. BENNETT:
Q. And that's on Page 45 of your materials and on the screen now; right?
A. Yes.
Q. Can you orient the Examiners and the audience to the -- where the Striker 4 Well is proposed to be located?
A. Yes. It is in the center of the -- the circle is the radius, the 2.25-mile radius. It's in the very center, it's the Striker 4 Well. You can also see the Striker at the two cross-sections, the N/S E/W cross-

section down a little bit, I think. There you go.

Q. Right here?

A. Yes. Those are the lateral -- the lines you are seeing are sections going N/S, those are the lateral wells in the area.

Q. Those are all lateral wells?

A. Correct. All these wells that have either red or green indicate they have logs, and if they have little red value -- number values next to them, those were control wells and those are their tops.

Q. And then again this is the Striker 4 Well here?

A. Yes, ma'am.

Q. And these are your contour intervals that you plotted?

A. Yes, they are.

Q. And in the materials you can see this a little bit better, but do the colors change, do the colors that coordinate with the contour lines change as you change thickness or change depth?

A. Yes. Yes. If you -- they are color coordinated, so as you move up-dip you start to see brighter colors, and down-dip, darker.

Q. What does this exhibit tell you about the Bell Canyon formation?

A. Ultimately the Bell formation, it's a regional dip to the southeast and going up to the northwest.

Q. And that's the same, same conclusion that you reached from the other three structure maps in terms of the dip?

A. Yes.

Q. What is the approximate thickness of the Bell Canyon at the wellsite?

A. I think we had it at -- let me turn the page -- 890 feet, or that's the -- oh, 926 feet.

Q. Okay, great. So without spending much time on the next three slides, those are the slides of the structure maps for the other three formations?

A. Yes.

Q. And they have the same properties, same legend?

A. Yes.

Q. Okay. Then let's look at Slide Number -- well, one of the things I wanted to talk about is the thickness of each of the formations. So the Bell Canyon you just testified was about 926 feet, and that's one of the injection intervals; right?

A. Yes.

Q. And then below the Bell Canyon is the Cherry Canyon; is that right?

A. Yes.

Q. About how thick is the Cherry Canyon altogether?

A. 1676 feet.

Q. And is NGL proposing to inject into the entirety of the Cherry Canyon, or just the upper?

A. Just the upper.

Q. Does that leave some of the Cherry Canyon that will be unimpacted by the injection?

A. Yes.

Q. About how many feet of that?

A. About 890 feet of Lower Cherry Canyon is not part of the injection interval.

Q. Will that act also as a lower confining area?

A. Yes.

Q. And below the Cherry Canyon is the Brushy Canyon?

A. Yes.

Q. About how thick is the Brushy Canyon in this area?

A. 1206 feet.

Q. Will that also act as a lower confining area?

A. Yes.

Q. What are the properties of the Cherry Canyon formation that allow it to act as a confining layer?

A. As seen in the cross-sections that we will go into, there are contiguous silt stone layers and you see tighter rock as you go down-dip or downhole the porosity decreases, so those attributes of the rock of seeing tight filtrant layers along with the tighter rock as you move downhole will cause a barrier for the water to migrate down to any sort of future production within the Bone Spring.

Q. And then the Brushy Canyon, is that, is that similarly composed of that silt stone?

A. Yes. There are also contiguous silt stone layers in the Brushy along with tighter rock characteristics.

Q. And we will see that when we get to the cross-section; right?

A. Yes.

Q. So the Lower Cherry Canyon and the entirety of the Brushy Canyon then would act as a lower confining area?

A. Yes.

Q. About how many feet thick are those two layers?

A. 2097 feet.

Q. And so that's the lower confining layer that would be between the bottom of the injection zone and the top of the Bone Spring.

A. Yes.

Q. Thank you. Let's turn to Page 46 -- actually not to 46. I meant 49. Just kidding, let's turn to Page 49. Is Page 49 the cross-section locator map?

A. Yes.

Q. And so this again shows, just for ease of reference, just the wells that you used for cross-sections?

A. Yes.

Q. Do those go from A to A prime?

A. They go N/S E/W.

Q. And Striker 4 is in the middle?

A. Yes.

Q. Okay. So in the materials I prepared an expanded view of the cross-section for everyone so that you can actually see the cross-section a little bit better. But is this, the cross-section you prepared, based -- for the W/E cross-section?

A. Yes, it is.

Q. And what does the -- do you have it?

A. Okay.

Q. What can you tell us about the W/E cross-section?

A. Similar to what I was just speaking to, you can see the pink perforation box on the Striker well in the middle, that is the indicated injection interval.

Q. This right here?

A. Yes. As discussed before, above it is the Salado and Castile which is primarily comprised of anhydrite and salt, which is a great barrier for the injection fluid, along with the roughly 2970 feet we discussed earlier of rock between the base of injection down to the Bone Spring, which it's hard to tell from the logs, but you can see that the rock characteristics are getting tighter and tighter as you move closer to the Bone Spring, which I think in a future exhibit we show that porosity trend with depth.

Q. Okay. Great. Now, the next exhibit is the N/S cross-section, which I didn't reproduce on the screen.

A. Yeah.

Q. Is there anything you would like to tell --

A. It's just similar. It's just showing the -- just a different strike of the formation, very similar, though.

Q. Okay. And then turning to Page 52, is 52 the -- or what is 52?

A. So 52 is what I have been speaking to about the porosity with depth correlation. As you can see, so porosity on the bottom, that's effective porosity, and it's 40 percent down to zero to the far right. So it's in decimal format, but that .4 is 40 percent, zero to the far right is zero.

So as you move down you can see the trend going, as you move down formation in the Lower Cherry and Brushy, you are getting tighter and tighter, and that was what I spoke to as, as a means of confining layer as not only as the -- are the sands within those formations tighter along with the silt stone layers that are contiguous across the area of review.

Q. And so by tighter, you mean it will act as a

lower confining area?

A. Yes. Lower porosity tends to indicate it's lower permeability as well.

Q. Okay. So in your view, the fact that the porosity is decreasing means that there is no likelihood or very little likelihood of this injection slurry migrating into an oil-producing zone?

A. Yes, I find it unlikely it would migrate over 2000 feet in these conditions.

Q. That's a good point. So it's not only that it's -- it's a very tight low porosity rock that we are talking about, but it's also 2000 feet?

A. Correct.

Q. Thank you.

MS. BENNETT: At this time I would like to move the admission of the exhibits behind Tab 2.

MS. BADA: No objection.

HEARING EXAMINER COSS: Exhibits will be so admitted.

(Exhibit 2 admitted.)

BY MS. BENNETT:

Q. Are there any final -- anything else you think that we need to ask?

A. No.

MS. BENNETT: At this time I pass the witness.

MS. BADA: I have no questions for this witness.

MS. BENNETT: Thank you.

HEARING EXAMINER COSS: Okay. Well, for this Poro v. Depth that we have, what are all the different colors?

THE WITNESS: So those are going to be your different wells. There is, at the top there is six wells involved, and so it's a scatter plot of the six different wells and their porosity.

HEARING EXAMINER COSS: Six wells from the cross-section.

THE WITNESS: No. The six wells used for the petrophysical analysis that they will speak to later.

HEARING EXAMINER COSS: I see, cool. And so again with the porosity permeability -- good morning, thanks for your testimony. I forgot about that. I don't want to come off as --

THE WITNESS: That's okay.

HEARING EXAMINER COSS: But, so are you proposing -- I know this came out -- that Brushy Canyon or that Bell and Cherry in the Delaware Mountain Group can be interbedded with a lot of silt stone and sandstone. Are you proposing for this well to perforate the whole section, or you have intermittent perfs?

THE WITNESS: I can't speak to what NGL wants to do after they drill and evaluate the log and see which zones they actually want to perf, but I would imagine they would probably try to stick with the more porous sands and avoid the silt stone layers found within the Delaware Mountain Group.

HEARING EXAMINER COSS: Sure. And then, so does the -- so does the proposed -- would that affect the proposed -- you have reported that there is this whole, the whole Brushy, Bell and Cherry section for your injection interval, but it could potentially have 100 feet less of total interval that would be perfed?

THE WITNESS: Are you saying there could be less actual perfed interval than the applied-for permit interval?

HEARING EXAMINER COSS: Yes.

THE WITNESS: Yes, it's very possible, depending on how NGL wants to complete it after they drill and evaluate their logs.

HEARING EXAMINER COSS: Is there anything in here that will kind of guide me as to how much pay zone, as it were, will be perfed in here.

THE WITNESS: No. That has to be determined after they drill it and run their open hole logs, because once they have their data and what they want to personally -- because they make their own cutoff; right? If they want to perf ten percent porosity because they want to, then that's their call. So it's -- it's up to them based on what they want to perf -- which sands then they want to perf for optimal use.

HEARING EXAMINER COSS: I see. Is there any reason to believe because of depositional patterns in the area that there could be -- there won't be a lot of pay in this area, it will be more silty?

THE WITNESS: In the area it looks pretty contiguous. Any offset wells in the study I made there was no major reservoir characteristic changes that I saw.

HEARING EXAMINER COSS: Would you care to venture why this particular area is an unproductive area -- well, how far away is the nearest productivity in the Delaware Mountain Group?

THE WITNESS: I think it's two and a half or two point -- something like two and a half, but it was -- and Brian will speak to it, he did the evaluation on it, but it was very, very wet. There was lots of water production, very little oil whatsoever.

HEARING EXAMINER COSS: In this area?

THE WITNESS: 2.5 miles away. There was no production within our area of review.

MS. BENNETT: And Mr. Davis has prepared a petrophysical analysis to demonstrate the lack of hydrocarbons in the Delaware Mountain Group.

HEARING EXAMINER COSS: In this particular area?

MS. BENNETT: Yes.

THE WITNESS: Yes.

HEARING EXAMINER COSS: To seek -- well, I will ask him. Can you venture a guess at why this area is not productive whereas some others are?

THE WITNESS: I would probably have to say it's something to do with the trapping. There's no faults in the area, no traps close to here. That would be my guess, I haven't really -- I usually stick with SWDs.

HEARING EXAMINER COSS: Okay. So -- so the trapping mechanism is the presumed reason that this area isn't productive, whereas other areas -- oh, okay, you didn't know. Just clarifying that.

And did you, in your evaluation it's hard for me to tell really on first pass of these cross-sections, did you see any difference from the N/S cross-section to the E/W in the character of the wells?

THE WITNESS: No, not enough to raise any red flags.

HEARING EXAMINER COSS: Okay. Would you -- did you see enough to maybe place the well in sort of like a depositional model, or how far you think you are from the shelf, or will this be in a big splay or a in big channel, would you say, or is this kind of --

THE WITNESS: The rock in the area is pretty contiguous from a stratigraphic standpoint. We didn't see -- we were, I think, more the location was chosen for geographical reasons, but it also fell in line with the geologic backing that it was contiguous in the area. So we weren't concerned with the geology based on the geographical decision to place the well there.

HEARING EXAMINER COSS: Sure. Okay. And how far away are we from the Reef here?

THE WITNESS: I don't have it on my map, but I can tell you that we're probably upwards of three miles, four miles from the Reef.

HEARING EXAMINER COSS: Okay. Perfect. Well, I believe that's all my questions, so I will let Mr. Ames -- I may come back, but that's it for the time being.

MR. AMES: Good morning.

THE WITNESS: Good morning.

MR. AMES: So I'm looking at Page 52, your Porosity v. Depth study.

THE WITNESS: Yes.

MR. AMES: I'm trying to put into context your testimony. If I understood correctly, you said that you would be disposing or you would like to dispose in the, in the Bell; right?

THE WITNESS: Bell and Upper Cherry.

MR. AMES: Bell and Upper Cherry, okay. So how far down in the Cherry?

THE WITNESS: I believe we are, looking back, so 1676 minus 890, so that's 7 -- roughly 700 feet into the Cherry, I think. Is that -- I'm a geologist.

MR. AMES: Which would put us where? I'm not going to venture to do the math, so I will ask you to.

THE WITNESS: That would put us to 7200 is the base of injection.

MR. AMES: 7200?

THE WITNESS: Correct.

MR. AMES: All right. So that 7200, and the base of the Cherry is just above 8150?

THE WITNESS: That's correct.

MR. AMES: So about 950 feet; is that correct?

THE WITNESS: 890.

MR. AMES: 890, 900 feet then, all right. Okay. And so what is the average porosity at the proposed base of 7200?

THE WITNESS: I do not have that value on me right now. I believe our reservoir engineer ran the models for average porosities in the area. I don't -- if I were to look from just an eye-balling standpoint, I would say it's roughly 12 percent to 10 percent.

MR. AMES: So 10 to 12 percent average porosity at the base of your injection interval?

THE WITNESS: Correct.

MR. AMES: And the reservoir engineer has done an analysis that will be more specific?

THE WITNESS: Yeah, he has done a model with these porosities, a plume model of where he thinks it actually will travel.

MR. AMES: Okay. And what is the average porosity at the base of the Cherry?

THE WITNESS: Just based off the graph, I would say something around between probably 5 percent, maybe less.

MR. AMES: Okay. So 900 feet of decreasing porosity, decreasing from somewhere between 10 and 12 to 5 percent.

A. Yeah. Actually it's 2000 feet of decreasing porosity if you are including the Brushy as well.

MR. AMES: Including the Brushy?

THE WITNESS: Yeah.

MR. AMES: But the Bell, Cherry, and Brushy are all part of the DMG itself?

THE WITNESS: Correct.

MR. AMES: So when you refer to 2000 feet, you are referring to the difference between -- or the distance from the base of proposed injection to the Bone Spring?

THE WITNESS: Correct.

MR. AMES: Okay. But it's 900 feet -- well, it's in the Cherry, but it's a decrease over that 900 feet from 10 to 12 to 5 percent porosity?

THE WITNESS: Correct. And the reason -- I was going to say, the reason for the 2000 for the Bone Spring having future production and future hydrocarbons, the Brushy is not productive in the area nor has very much future development.

MR. AMES: Cherry as well?

THE WITNESS: Correct.

MR. AMES: Okay. All right. And when you say you don't expect any production in the area, what is that based on? Is that your testimony to give or someone -- or one of the other witnesses?

Venture a guess, venture your opinion based on the fact that you know, and I will ask what fact.

THE WITNESS: We have had discussions with offset operators with their -- them asking about these type of injection wells, and from what sense we have received from them, it doesn't seem they are too worried about the Brushy Canyon's future development versus Bone Spring and Avalon shale. That would be my basis of my argument.

MR. AMES: Okay. So you had conversations with other operators in this area?

THE WITNESS: Yes.

MR. AMES: And they reported to you that they don't anticipate any production in these formations in the vicinity of this well?

THE WITNESS: Not particularly to this well, we did not -- I'm just saying in general.

MR. AMES: In general?

THE WITNESS: Yeah, for other wells in the area.

MR. AMES: In the area. So with respect to this well, you have no data, and you are not testifying today that you know that there is not likely to be production in this -- in these formations.

THE WITNESS: No.

MR. AMES: Okay. You said that there was interbedding in the, in the Bell and Cherry, I think, in response to a question from Mr. Coss; is that right?

THE WITNESS: Yes.

MR. AMES: And that you would decide where to inject within these formations based on your evaluation of the logs?

THE WITNESS: Yes.

MR. AMES: Okay. Would you have any objection to the Division having a say where the well should be perfed?

THE WITNESS: I think I would. I think that's up to NGL.

MS. BENNETT: And Mr. Jessee is a consultant for

NGL so wouldn't have the authority to agree to a condition like that on NGL's behalf, but I would be happy to take that back to NGL and see if they would be willing to. But I believe Mr. Jessee's testimony is that it cannot be determined without the logging being done first.

MR. AMES: So my question was that you are going to determine where -- where to perf based on your evaluation of the logs; right?

THE WITNESS: Yes.

MR. AMES: Is there a witness from NGL here who can testify to their -- whether they would be willing to consult OCD before -- as to where the well should be perfed?

MS. BENNETT: There isn't an NGL witness here.

MR. AMES: There is?

MS. BENNETT: No, there is not. However, NGL has been and continues to be actively engaged with OCD and would welcome the opportunity to discuss this further with OCD.

MR. AMES: Well, we are actively engaged right now, and I assume we will be through this entire process, so I appreciate that. All right. No further questions. Thank you.

MS. BENNETT: May I ask one question on redirect, subject to the same conditions?

HEARING EXAMINER COSS: Uh-huh.

REDIRECT EXAMINATION

BY MS. BENNETT:

Q. A moment ago you were asked if you have any -- if you were testifying about producible hydrocarbons in the Delaware Mountain Group and you said no. Is there a witness that NGL has who will be testifying about that?

A. Yes.

Q. Is that Mr. Davis?

A. Yes.

MS. BENNETT: Thank you.

HEARING EXAMINER: Well, with that, Mr. Jessee, thank you.

THE WITNESS: Thank you.

MS. BENNETT: Thank you.

At this time I can either call my next witness or we can take a break. Whatever the Division's preference is.

HEARING EXAMINER COSS: Do you have a time frame for how long this next witness' testimony might take?

MS. BENNETT: Probably about 20 minutes, and I have one more witness after Mr. Davis that I anticipate will also take 20 minutes.

HEARING EXAMINER COSS: Yeah, it's time to take a short break now before lunch and see if we can get both witnesses in before lunch, but five minutes now, and then both witnesses after the five-minute break.

MS. BENNETT: Thank you very much.

(Recess taken.)

HEARING EXAMINER COSS: Back on the record. We will proceed then with the record.

MS. BENNETT: I would like to call my next witness, Mr. Brian Davis.

BRIAN DAVIS

(Sworn, testified as follows:)

DIRECT EXAMINATION

BY MS. BENNETT:

Q. Please state your name for the record.

A. Brian Davis.

Q. For whom do you work and in what capacity?

A. I work for Oil & Gas Evaluation Consulting, OGEC, which is a company I have with two other partners.

Q. And have you been retained by Lonquist?

A. Yes. To do the petrophysical evaluation in the area.

Q. For this particular application?

A. Yes.

Q. So you are familiar with the application that NGL filed?

A. Insofar as my piece of it, yes.

Q. And have you previously testified before the Division?

A. Yes.

Q. When was that?

A. It was approximately August for the Milestone Beaza Well, I believe it was the Number 1 permit. And prior to that as well, but it's been two or three years prior to that, and I don't remember the case.

Q. Okay. And was the Beaza Well also a slurry injection well?

A. Yes, it was.

Q. Is it in the same general vicinity as this proposed well?

A. Yes.

Q. And when you testified before the Division in August, were your credentials as a petrophysicist accepted as a matter of record?

A. They were.

MS. BENNETT: I would like to tender Mr. Davis as expert in petrophysics.

HEARING EXAMINER COSS: Do we have any objection?

MS. BADA: No.

HEARING EXAMINER COSS: He is so recognized.

MS. BENNETT: Okay. Thank you.

BY MS. BENNETT:

Q. So you prepared a petrophysical analysis for this case; right?

A. Yes.

Q. And for this hearing in particular?
A. Yes.
Q. And before we talk about your petrophysical analysis, what was -- what was your role or why were you retained by Lonquist and what's your role in this proceeding?
A. Primarily to determine if there was any hydrocarbons in the area that would be adversely affected by injecting water into those intervals.
Q. When you say in the area, do you mean within the Delaware Mountain Group?
A. Within the Delaware Mountain Group within the two-mile limit.
Q. So you were looking at -- you were analyzing whether there are producible hydrocarbons, or any hydrocarbons for that matter, within the Delaware Mountain Group formation within the two-mile radius of the well?
A. Correct. And we did have to go slightly outside of that two-mile radius, and that was a function of we had to have wells that had all of the data we needed in order to do the petrophysical calculations.
Q. And there was one well right outside the two-mile radius?
A. Correct.
Q. And that is a well that you -- was a well that

you chose to include in your modeling?

A. Correct, yeah. And we didn't actually do a petrophysical analysis on that well, but what it did was proved part -- it proved the basis for the petrophysics when we get a little further down the road.

Q. So sort of the proof of your modeling?

A. Correct.

Q. And is your study behind Tab 3 of the materials?

A. Behind Tab 3? I would assume it is. I don't have the full tab --

Q. Okay, yes. As with other presentations, there are more materials behind Tab 3 than what we will be showing on the screen.

Before we even start talking about your petrophysical analysis in detail, what was your conclusion about whether there are producible hydrocarbons within the two-mile or 2.25-mile radius of the well?

A. I you saw no indication of producible hydrocarbon based on the wells I evaluated.

Q. And that's no evidence of producible hydrocarbons in Bell Canyon formation?

A. Bell Canyon, Cherry and the Brushy.

Q. And Brushy?

A. Those were the three that I evaluated. I did not look down into the Avalon or Bone Springs.

Q. Okay. But you concluded there was no hydrocarbons or no producible hydrocarbons in any of the three formations?

A. That I could see, no.

Q. Okay. Let's start with Page 53, which is the page that I also have up on the screen. Do you have that in front of you?

A. Yes.

Q. Can you tell the Examiners what this slide is?

A. Yeah, and if y'all don't mind, I'm going to stand up to point a little bit. So basically here is the Striker 4 Well, proposed Striker 4 Well. This is the Beaza Well which has been -- permit has been reviewed by OCD. That's -- well, 1 -- 1.2 miles away, somewhere in that ballpark.

Here is the two-mile radius. Here is one of the wells where we had a drill stem test on. That's why -- that's kind of one of the wells that validates the petrophysics, and that's why we expanded the radius out to the 2.25 to sort of look at those extra wells.

And then all the wells you see here are wells that were used within the petrophysical study. And there's one that's hard to see, but it's right there, and it's actually outside, but we went ahead and looked at it petrophysically as well.

The reason we kind of had to go a little farther with the petrophysical side, we didn't have enough quality data points inside the two-mile radius because a lot of logs were older generation and didn't have the modern-day logs we need to calculate petrophysics.

Q. While we are at it, how do you generate or gather data to run your analysis?

A. What we typically do is get data from a source such as IHS, which is one of the commercial vendors. And they effectively go into your files, they scan the well logs you have on record, and then they resell them out to people for ease of access, and they typically depth register them and things like that.

But then they also will take the data and convert it back to a digital format. By digital format, I mean they have the data where each, it's depth point, and it has the value of the curve at each depth point, and then those files are what we ultimately use to run our model on a depth basis.

Q. Do you compare the digital file to the paper file to make sure the digitization was accurate?

A. Absolutely. That's part of the QC process. We look for washouts. We look for that the digitized data matches the original master paper copy. That's all part of the QC process we go through prior to computing for water sectors.

Q. That's the methodology that you use to assure quality control?

A. Yes.

Q. That's what you do for any project like this?

A. Yes.

Q. That's what you did for this project?

A. Yes.

Q. Is that -- so then one of the things we talked about yesterday is this Groningen effect, G-r-o-n-i-n-g-e-n effect?

A. Yes.

Q. What is that?

A. Well, the Groningen effect is the effect you see on logs when you have large non-permeable formations above say a sandstone formation. So in this case we have a very large thick anhydrite immediately above our -- the Bell Canyon. And so what happens is, is with some of the older generation logs which are called old lateral logs which are the LLD logs that we will be talking about here, those lateral logs are affected because they -- they measure the system differently.

What happens is you emit a current down the hole through a logging tool, and that current returns back to the surface. At the surface is where you measure that current return. So as a result of these very thick anhydrites, it impedes the return of the current, and that effect typically happens about 200 feet below the anhydrite.

So you will see a variation on the log, and to the untrained eye, it can often look like hydrocarbon pay, when it's not. It's a well-recognized, well-documented effect. Groningen is a small town in the Netherlands where they originally found this concept.

Q. So in a situation where there is this thick, upper layer of anhydrites, when the current goes down and then normally it would come back up and that's how you would test or read the logs to determine if there are hydrocarbons, but when there's a thick layer it acts as a dampening tool?

A. It's really the density of the layer. It's a thick, dense layer that's impeding the current return back to surface.

Now, we have some other wells that have induction logs, you don't get that same effect because what happens is you run your current down to the tool, and the current returns back to the tool itself, so you don't have the effect of that overlaying, thick, non-porous anhydrite that we see with the lateral logs.

Q. So the two, even though the geology is the same that there is this anhydrite layer, one type of testing

gives sort of a false positive for hydrocarbons, and the other type of testing would give a more accurate representation of the --

A. Right. The tools measure in two different ways. And because one measures in the way it does, it's impeded to -- it's just immediately below, about 200 feet below the casing.

Now there is typically another log associated with that, it's the LLS curve, which is the shallower curve, and you don't see that effect on the shallow curve but you do see it on the deep curve. Unfortunately the deep curve is usually the curve we try to use to make our water saturation calculations from. I know everybody is finding this extremely fascinating.

Q. So to put this on a perspective, if a -- we need to understand the Groningen effect to be able to interpret what could otherwise seem like a positive attribute of hydrocarbons, but when you look at the other logging type with the other data type, you can see it's not -- there aren't hydrocarbons?

A. Correct. If you don't understand what the Groningen effect is, you're going to go out and shoot a well that looks like it's productive in pay, and you are going to produce water, as was actually the case with our drill stem test on the well I was talking about earlier. Somebody probably shot that well, not realizing the Groningen effect was involved, and that was the well that produced 100 percent sulfur water.

Q. So it was 100 percent water?

A. Yes.

Q. And that's within the 2.25-mile radius?

A. Yes.

Q. So the next slide that we have is Page 55 of the materials, and it's labeled 3002530179 --

A. Yes.

Q. -- well example of Groningen effect. Is that first number the API number?

A. Yes. That is the state API number for the well.

Q. What does this slide demonstrate in terms of the Groningen effect?

A. What it actually shows you here is basically about that 200 feet as I was mentioning, in this case it's 185 from the top of the Bell Canyon, but about 200 from the actual anhydrite, what you'll see is you start to see a separation between your shallow and deep resistivity curve.

And what happens is that deep resistivity curve artificially goes up, and you can see here it's almost six, seven ohms. And you if you use six, seven ohms to go calculate your water saturation, it's going to say, "Hey, you have oil here," when in fact, you don't because the deep induction log is erroneously reading what it should do.

And you will see down below the green and red line, which is the deep and the shallow actually track each other until you get up to that point where it starts to inflect from each other as a result of those upper anhydrite sequences.

So what we do is we should be able to use the shallow resistivity as the appropriate curve to calculate the water saturation.

Q. And earlier we were talking about some of the QC that you do including looking for washouts. Does this give an example of a washout?

A. Yeah, here is an example. If you see the area shaded under white, I believe it's zero to 20, so your wellbore is almost washed out to 10 inches above the normal wellbore, what would have been the bit size. So this is extremely washed out.

And as you get a washed out borehole, the tools can no longer make contact with the actual formation wall, which is important in a log quality control process, and when the borehole gets too big, you start to degrade the resolution and you have to be careful about that, and I tried to flag that in most cases.

Q. Great. Is there anything else that you wanted to mention and discuss about this slide?

A. Well, I will actually touch it with the other slide, but there is four wells listed there on the slide, and three of those wells were additional logs that had this same problem, and one of the logs was an RLA-5 which had a -- it's less affected by it because it's a newer-version tool, but it still has that similar effect to it, so we'll see that on the cross-section, I believe.

Q. Yes. So the RLA-5 still does show a little Groningen effect, but not --

A. Correct, not as severe as the deep lateral logs, LLDs.

Q. A moment ago you were talking about the anhydrite sequence overlying the Bell Canyon that causes the Groningen effect. Is this the slide that --

A. Yes. This is just a slide showing the anhydrite sequence. So the Bell Canyon would start right in here about, you know, 20 feet down, which is where our log started from.

This well was actually probably about four or five miles away, and it was one of the only wells we could find where we actually had proper resistivity data because they don't typically log the shallow section with open hole logs. We will typically do that on a cased hole base with a neutron and a gamma ray as opposed to a resistivity log. They generally don't log the shallow anhydrite salt sequences.

Q. When you say "they," you mean the person, the company?

A. The operator, the operating company, yes.

Q. So that's why you had to choose, for this particular slide, you had to choose something four miles away because normally there isn't this type of log?

A. Correct. This was the nearest log we could validate the anhydrite sequence from, but I think it's fairly common knowledge that anhydrite sequence is blanket throughout the area.

MS. BENNETT: Okay. So the next slide in the materials is Page 57, and we've actually prepared an expanded version of this slide that we will pass out now. It's the exact same slide, so I have marked it 57 E-x-p for expanded. It's on the screen in the materials, same exact slide, just expanded.

Q. So this -- what does this slide tell us or show you?

A. Yeah, this -- this particular slide I set up with just the raw resistivity curves from the five wells we used in the field study. And so what this does is allows us to see which wells are primarily affected by the Groningen effect. And if you'll notice -- and I've got a cross-section reference map as the next slide so you can see where it went through the section.

So this particular well -- and this is just the top of the Bell Canyon. Here is the red line, and you'll see that that separation effect shaded in yellow that we saw on the previous slide, these are the LLD logs. Then when you get to the ILD log, you'll notice you don't see that separation between the deep, the medium and the shallow with an induction log, because the induction log, if you remember, is the log I explained the current returns back to the tool so you don't have the effects of the anhydrite.

So when you look at the induction log, you'll see those curves overlay nicely and don't create this false track as a result of the overlying anhydrite.

These two actually were induction logs, and the far right well was RLA-5 which was a lateral log type well. You can see a little bit of yellow shading, but the effect drop is not as dramatic because it's a newer version tool, and they've kind of refined some of that effect out of them. But these were primarily the five wells we used, and then we adjusted on the Groningen effect logs to be able to use the shallow to calculate the water resistivity.

Q. So you have included this slide to show the difference between what an LLD log looks like versus an ILD log?

A. Correct. Correct. So an ILD log you don't see that effect, so therefore you don't have to adjust for, you can just run the ILD log through your normal model and calculate a water saturation.

Q. But if it's an LLD there is something further --

A. You have to make some adjustments and further steps, correct.

Q. And in the materials, the next page is Page 58, which is your petrophysical methodology, which I haven't reproduced on the screen.

A. Right.

Q. But we will be talking about some of that as we go along?

A. Right. And those are just my base assumptions for those of you who want to have petrophysics as a hobby.

Q. So the next slide I put on the screen is Page 59, which is the cross-section reference map you were just talking about?

A. Yes. And that previous cross-section effectively goes from here down to this well, included back over here, and all of these were actually wells that we had full suites of logs on. We did actually have full suites on a well up here which we looked at during the Milestone hearing, but unfortunately we thought the resistivity was shifted high throughout the whole log, and we didn't have a lot of confidence because it wasn't reading consistent with other wells in the area.

So as a petrophysicist sometimes you have to look at logs and realize it could have been a calibration problem when the log was run 20 years ago, something of that nature. We did not throw it out for any bad reasons like we are trying to slip something by. It was a legitimate concern from a petrophysical basis. But here is going to be the cross-section that we pulled, and we will talk about the dips up here.

Q. In your opinion, are the wells that you did choose to use representative or valuable for your measurements that you need to do for the petrophysical analysis?

A. Yes. Yes.

Q. The next page is the Bell Canyon structure map that has your petrophysical analysis overlaid on it; right?

A. Correct.

Q. Can you describe a little bit about this slide for the Examiners?

A. Yeah. So what we did is I just took the structure map as provided by the geologist and overlaid it onto my map. And you'll remember we pulled that cross-section down through these wells right here, and the reason is is we wanted to look downdip at wells and wanted to look at the water saturation as it moved updip through the section.

So what we found was -- is that this well down here calculated wet. This was our water test in the Bell Canyon where they had shot it and it produced 100 percent sulfer water, as they called it, from the drill stem test from the OCD records, and all of these wells up here calculated 100 percent water saturation in the Bell Canyon, and we'll see that on the next slide.

Q. So when you say calculated, does that mean you calculated water?

A. Calculated with very, very high water saturations bordering right at 100 percent.

Q. For a layperson like myself, does that mean if it's 100 percent or near 100 percent water saturation, does that mean zero or near zero hydrocarbons?

A. That's correct.

Q. Let's look at the next slide, which is Page 61.

A. Okay. I apologize, this one is a little small, we are trying to compress 1000 feet into one section, so I know it is a bit difficult to read.

Q. Before you start talking about it though, we did prepare a larger expanded version of the slide for the hearing. This is the same slide but marked 61 E-x-p for expanded.

A. Okay. So briefly talk about this slide. What the -- kind of the key track in the slide is the second, this far right track with the yellow and the blue in it. The blue is indicating that it's calculating water. If you saw any black that would be an indication of hydrocarbons.

So what we've got -- and I've actually got the water saturation in the track next to that which you might be able to see. Again I apologize, this is small. We are going to give you guys some PDF files which you can blow up on the screen and see in better detail.

So all of these five wells showed the same thing where there is no recognizable showing of hydrocarbons in the Bell Canyon section that I was able to see after doing my petrophysical evaluation.

You will also notice there is a little brown in the far right well. Those brown are actually bad hole flags. If you remember the one well I showed you where it had the big washout directly underneath the Bell Canyon, we were flagging that data as being suspect because we had such a big washout and we weren't confident whether the porosity tools were reading correctly.

Q. So when you look at this cross-section on the Bell Canyon, what is your conclusion regarding indications of producible hydrocarbons in the Bell Canyon?

A. I do not see any producible hydrocarbons in the Bell Canyon, and this analysis through the cross-section goes from downdip through and updip of the actual where the disposal well is going to be in the structure.

Q. So you feel that your conclusion would apply equally to this particular well knowing that --

A. Yes. Because we're moving structurally updip, and that well is about in the middle of all five of these wells. So there is wet wells below and wet wells above. So you know, barring any geological trap between those wells, which Mr. Parker did not see any evidence of geological traps such as a fault, we would be very confident that the entire section is wet.

Q. Okay. Thank you. So you prepared the same analysis and the same slides for the Cherry Canyon and the Brushy Canyon; right?

A. Yes.

Q. Those are actually in the materials, and I didn't reproduce those for the screen, but we can walk through them quickly in the materials.

A. Yeah, I've --

Q. You don't have them.

A. I don't have them in that one.

Q. But they're right behind your outline there. They are Tab 3, and if you turn to Page 62.

A. Tab 3, 62. Got it.

Q. Okay. So is this a structure with petrophysics

that you prepared for Cherry Canyon?

A. Yes. This is the structure map on the Cherry Canyon. Again that structure map came straight from the geologist, I simply incorporated it into my map.

So what we see from this is we have wet wells above and below which was -- you know, we basically saw the exact same thing as we saw in the Bell Canyon. We didn't see any indications of hydrocarbons in the Cherry Canyon.

Q. We've also prepared a larger, expanded cross-section of the Cherry Canyon cross-section logs as well which we have marked as 63 E-x-p. When you -- what's your take-away from this cross-section of the Cherry Canyon?

A. I do not see any producible hydrocarbons based on the petrophysics in the Cherry Canyon.

Q. Does this have the same sort of low porosity, low --

A. As you get deeper in the section, the porosity actually starts to decrease, which I believe we saw on the exhibit that Parker discussed earlier.

Q. Okay. So your, your data also confirmed or the --

A. I actually provided that data to Parker for that, yeah.

Q. Okay. Then let's turn to Page 64 in the materials.

A. Yup.

Q. And --

A. That -- sorry, go ahead.

Q. Although it says Brushy Creek Structure with Petrophysics, it's actually Brushy Canyon Structure with Petrophysics?

A. Yes, sorry.

Q. That's okay. And what's your take-away from this structure map?

A. Same conclusions. We have -- I don't see any producible hydrocarbons in the Brushy Creek -- or Brushy Canyon, sorry -- based on the petrophysical analysis of the five subject wells we looked at.

Q. Turning to the next page is the Brushy Canyon cross-section, and we prepared a larger version of that as well for everyone, marked 65 E-x-p. When you look at the -- and this is the cross-section you prepared for the Brushy Canyon; is that right?

A. Yeah, I got it right on this one.

Q. Yeah. And what's your take-away from this slide?

A. My take-away from this slide is, as Parker stated earlier, not only is the porosity is getting tighter as we get deeper, but we also don't show any hydrocarbons based on the petrophysical analysis as being present in the Brushy Canyon section.

Q. So it's your conclusion based on your petrophysical analysis there are no producible hydrocarbons on this Bell Canyon?

A. That is correct.

Q. And none in the Cherry Canyon?

A. Correct.

Q. And none in the Brushy Canyon?

A. Correct.

Q. Okay. So in your opinion, are there any economically producible hydrocarbons in the DMG formation that we have looked at at all?

A. Not in the subject wells I have looked at.

Q. In this area?

A. In the area, no.

Q. Yesterday we talked about impairing correlative rights. And in your opinion, would the granting of NGL's application result in impairment of any correlative rights?

A. No.

MS. BENNETT: At this time I would like to move the admission of Exhibit 3.

MS. BADA: No objection.

HEARING EXAMINER COSS: No objection, Exhibit 3 is so admitted.

(Exhibit 3 admitted.)

MS. BENNETT: Thank you. At this time, I have no further questions for Mr. Davis.

MS. BADA: No questions.

HEARING EXAMINER COSS: Well, I just have some simple questions on these cross-sections. I can't -- I'm looking at Page 65 E-x-p right now. What -- which log have you computed porosity on? Is there a porosity log on these, or what is each color?

THE WITNESS: Okay. So we'll start with the far left track. The far left track where the green curve is in, that's the gamma ray. Okay? Then of course you have the depth track, which is the white space. And I know these are extremely small even when we have blown them up, and we'll provide you guys with larger PDF files that you'll be able to review on the screen and be able to see better.

So the next track is going to be the resistivity track. That will be the darker track with the red line immediately to the right of the depth track. The next track is going to be the raw porosity curves which will be the density and neutron curves from -- and so those -- effectively those first three tracks are all the raw log data as was recorded on the truck at the location when the they originally logged the well.

Okay. The fourth track is going to be the total porosity computed from the neutron and density curves, and that was done with a cross-block porosity from the service company vendors. And we calculate the total porosity, and then we take the total -- and that would be the blue curve. And then the red curve is going to be the effective porosity where we subtract out the effects of the shale. So the red curve is the effective porosity.

And what we typically look at from a reservoir perspective is the effective porosity because that tells us what the actual capacity of the rock to hold fluids is because the shale obviously has water bound to it. Okay?

The next track to that -- there is kind of a color track where you see a little yellow there, but the track to that immediately to the left of the track with the sandstone looking kind of shading, lithological looking track, that track at the left there is the track with the calculated water saturations. Obviously with 100 percent water saturation being 100 percent wet, and zero on the right, which if you have any kind of hydrocarbons you would see that curve move to the right, and we didn't see that on any of the wells.

And then the far right is more of a lithological, sort of showing you what the sands and the shales are kind of coming in -- or sands and silt stones, really, clay stones coming in and out based on the gamma ray. Hopefully that makes things a little clearer as you sort of look at it.

HEARING EXAMINER COSS: Yeah. You know, what I'm going to ask for on one of these is you're going to submit this in a PDF file, but could you extract one of the wells that's -- that you think is going to be the most representative, and just have maybe the interval, the upper-most interval that you are going to give me kind of a more in-depth.

THE WITNESS: Absolutely. What I will do is give you the same presentation, but like on a five inch per hundred scale, and again I can put that in a PDF for you and it will be much more readable. Absolutely.

HEARING EXAMINER COSS: Could you also break down how the thickness of total porosity, like a functional porosity?

THE WITNESS: I believe Dr. Jordan has that.

HEARING EXAMINER COSS: Dr. Jordan?

THE WITNESS: Yeah, I believe he is going to be discussing the porosity breakdown. I had taken the effective porosity numbers and exported them to a file with depth, and then he used that in his modeling, so I sort of moved that piece over to him.

HEARING EXAMINER COSS: I see. And getting back to the Groningen effect, is there any other kind of validation method that you have like, okay, so my resistivity logs are giving me a false reading, is there some chance it could be a correct reading and you need some third method to rule it out and validate?

THE WITNESS: Well, and that was sort of part of the process because if we -- and I didn't actually get that particular well, and I understand your question, but if we were to look at the well, if we can go back to the slide that has the base map on it. Okay.

So if we were to look at this well right here, this well was actually also logged with an LLD log, and we have a drill stem test on that well that produced 100 percent what they call sulfur water, and there was no oil production. And that has that same splitting off effect of the LLD and the LLS curves that we saw on the other two wells that we evaluate.

Unfortunately this well did not have a porosity log, so I was not able to interpret all the way to a water saturation calculation using the porosity log. But this well, you will see that same Groningen effect on this well once it was shot at that six, seven ohm resistivity that produced 100 percent water.

And these other wells are going to six, seven ohms, and that six, seven ohms is the water, basically the -- it validates that that's what's going on with the Groningen effect, because we actually have a real drill stem test data on the well that produced 100 percent water with no hydrocarbons which really validates that it is indeed the Groningen effect and not something else going on such as, hey, we've got a bunch of hydrocarbons here.

HEARING EXAMINER COSS: Perfect. The only other thing that I haven't been quite convinced of that could potentially happen, I have seen other analysis from productive fields in the area where they have -- they found a productive area where there is oil sitting on top of the water. So they have cross-sections all over hill-and- dale that will show, you know, water to the left, water to the right, and in the middle of their field was productive, is the oil. Is there anything that, you know, potentially could be happening here, that we have gone -- picked all around and there is not a pool?

THE WITNESS: We calculated a section from top to bottom calculating the water saturation, and it behaved very well, but sometimes we don't have all the data that you know we need sometimes. I think we have done a pretty good job here of that.

There was actually a Delaware Mountain Group well that produced out of the Delaware Mountain Group that was, I believe, up here in Section 10, I believe is where it was. That well actually -- it was in the middle of the -- it was in the Cherry Canyon, the base of the Cherry Canyon and the top of the Brushy Canyon, and that well was perforated over an interval, and it did 36 barrels of water for the first month with 1200 barrels of oil, and the next month they P and A'd the well.

And that was about three miles away from where we are doing the disposal well, and it was updip from where we are at. So that's about a 3 percent oil cut. So I agree with you, sometimes you you can get a little hidden base and don't necessarily see all the finer details on the petrophysics. Could that be the case here? Yes. But is that economically viable? I don't see that based on the information I reviewed.

MR. AMES: Dr. Davis, in the --

THE WITNESS: I'm not Doctor, I'm Mister. I'm Brian, if you like.

MR. AMES: Mr. Davis, in the example you used I think you might want to reevaluate your data. I think you said 36 barrels of water to 1200 barrels of oil.

THE WITNESS: 36 barrels -- sorry. 36 barrels of oil to about 1200 plus barrels of water. I would have to go back and look the actual numbers up, but that was about from memory.

MR. AMES: I wanted to make sure you were --

THE WITNESS: Did I have it flipped? I'm sorry, I apologize for that. That would make a good well. We would be out there leasing. What are we doing here?

MR. AMES: Yeah, what's wrong with them?

HEARING EXAMINER COSS: Thanks for answering those questions.

THE WITNESS: Yeah, absolutely.

HEARING EXAMINER COSS: I will pass.

THE WITNESS: I will provide you with a five-inch log with the detail through the section. I will pick one of the wells that would be appropriate so you can see the detail better so when you look at the cross-section it gives you a better reference point.

HEARING EXAMINER COSS: Perfect. Thank you.

MR. AMES: I have a couple of questions.

THE WITNESS: Yes, sir.

MR. AMES: With respect to Slide 59, you said that the logs for the well in the -- in Section 17 got thrown out because they didn't meet your standard for data reliability?

THE WITNESS: Yeah, and I discussed that in a little more detail in the -- in the Beaza -- sorry -- yeah, the Beaza with the Milestone application, and I have a slide from the Milestone application that kind of shows that elevated resistivity, and it was elevated throughout the whole section.

So I really believe, as a petrophysicist -- I used to run the logs, I'm an ex Schlumberger engineer, and I believe there was something wrong with the calibration on that log. It was reading higher in the clay stone section, not just in the sandstone section, so it was a universal kind of -- it just looked screwy to me -- I'm sorry, I don't know if we can use that language -- but it looked unusual to me.

MR. AMES: It's a technical term.

THE WITNESS: Unusual makes a better technical term.

MR. AMES: Did that well produce?

THE WITNESS: No. It had no production in it. And had I shifted the curve to sort of match these curves, it would have calculated 100 percent because I did actually do that exercise, but I just don't like to present shifted data. You start to flirt with things aren't real when you get into things like that.

MR. AMES: So I believe you testified that there were no producible hydrocarbons within two miles of the proposed well location?

THE WITNESS: That's correct, not that I saw.

MR. AMES: What is the definition of producible hydrocarbons?

THE WITNESS: Well, economically producible hydrocarbons, is what I meant to say. There was obviously that well at three miles away that did 36 barrels of oil and

1200 barrels of water, yes, it produced oil, but is that economic in today's world.

MR. AMES: Okay. How does one make a determination whether hydrocarbons are economically producible?

THE WITNESS: Well, I will defer to somebody who will sit down and figure out if a barrel a day for drilling a $2 million well, if a barrel a day for the next hundred years will ever pay out your investment, so I would say it would have to be based on your investment in the well itself.

MR. AMES: Your testimony today though is there are no hydrocarbons, period?

THE WITNESS: Not that I saw, that's correct, from the log interpretation.

MR. AMES: All right. So you said earlier that sometimes you don't have all the data that you would want in order to predict the presence of hydrocarbons.

THE WITNESS: Correct.

MR. AMES: You also said there weren't enough quality logs in the AOR?

THE WITNESS: I thought the sample group of the quality logs we have were good quality logs.

MR. AMES: You did?

THE WITNESS: There were some issues with some of the logs, but the five we chose I believe to be quality data, yes.

MR. AMES: So you had five logs to work with?

THE WITNESS: Yes.

MR. AMES: I didn't see anywhere how old those logs were.

THE WITNESS: They ranged actually -- I don't think we included that slide. That was in my full-blown presentation, and, no, it was the full-blown presentation. Hang on a second. No, we never printed out -- well, you printed it out yesterday. I can't remember all the exact dates, but I believe they ranged anywhere from like the, I want to say, late '80s, early '90s up to kind of 2005, 2008, in kind of that range.

And those were the more modern logs that had all the data we needed to be able to use. There was logs prior to that, but some of them just had sonics, which I don't like using a sonic. I prefer density neutron because it gives me two porosity tools I can use to better evaluate the formation. So we tried to go with the higher quality wells in the immediate area.

MR. AMES: Okay. So you do this kind of analysis on a regular basis?

THE WITNESS: Yeah. I have been doing it for -- well, I have had my own company now for 25 years, and I did it for seven years with Schlumberger prior to that.

MR. AMES: So how many logs do you typically have when you do an analysis on whether there is economically producible hydrocarbons in the area, in the vicinity of a proposed well.

THE WITNESS: I'm not sure. My piece, the petrophysical piece of the puzzle doesn't necessarily determine the economically viable piece. That typically gets moved to the reservoir engineer who says, how many feet of oil do I have? What's my porosity? What's my water saturation?

And then once they have taken that, then they apply the geological extent of the reservoir, how much oil do I have? How big is the area? How much does it cost to drill a well, and so on and so on.

That's the point in time when you say, is it worth spending a million and a half dollars to recover X? We need to recoup X amount of barrels in order to recover our million and a half dollar investment, and so forth, so on.

MR. AMES: Let me rephrase my question then.

THE WITNESS: Sure.

MR. AMES: How many logs do you typically have when you determine that there are actually producible hydrocarbons?

THE WITNESS: Oh, typically one.

MR. AMES: Just one log?

THE WITNESS: Absolutely, yeah. Because typically when I have one well, I can do a petrophysical evaluation and determine, you know -- well, now, I'm not sure that's going to make it economical, but if I have one log that penetrates hydrocarbon, I can provide the numbers, and then it's up to the geologist to determine the areal extent and if that becomes economical at that point in time. I'm still not sure I'm answering your question.

MR. AMES: You are talking about determining whether there are hydrocarbons from a well using a log from that well?

THE WITNESS: Yes.

MR. AMES: What about when you are trying to predict whether there are producible hydrocarbons from a well to be drilled using logs from other wells?

THE WITNESS: Well, that becomes really a geological question as opposed to a petrophysical question. Because if I have, if I have a well that shows hydrocarbons on it, and somebody says, "Well, they're here, they must be here," well, that's going to have -- you are going to have to get into a full geological picture. I can't promise you this log will look like that log, that's going to be based on geology and whether you are updip, lateral, faults, et cetera.

MR. AMES: You are purporting to prove the opposite, that are there no hydrocarbons using logs from other wells?

THE WITNESS: Correct, and I'm going from a downdip all the way through an updip structural model to show that with my water saturation calculations. They all calculate being very wet, 100 percent wet, most of them. You know, maybe some show 2, 3, 4, 5 percent possible -- you know, you get some jiggles in the data itself. The data itself is not perfect.

MR. AMES: I'm afraid my question may not be very clear or what I'm trying to understand is not very clear. You said you have done this kind of analysis, the kind of analysis you are presenting today in the past; is that right?

THE WITNESS: Yes.

MR. AMES: When you have done those analyses in the past, how many logs have you had to work with?

THE WITNESS: Anywhere from one to I've done full-field studies with 1200 wells.

MR. AMES: You used logs from 1200 wells to make a determination there is no hydrocarbons in a proposed location?

THE WITNESS: Well, no, because typically a petrophysicist is trying to find oil, not water.

MR. AMES: But you are doing the opposite today.

THE WITNESS: I'm doing the opposite.

MR. AMES: So I'm asking you, what you are trying to tell us today?

THE WITNESS: If you gave me one well, and I can actually take that well, and so for instance in this case where we have the drill stem test, right, so now I've got a calibration point with which to establish my petrophysics.

So when I now run my petrophysics I'm going to have to select an RW value that goes into the water saturation equation, and I have to make that zone 100 percent wet because I have a drill stem test that produced 100 sulfur water, right? I can't put any hydrocarbons in that interval because it didn't produce any hydrocarbons out of that interval.

So once I establish a benchmark, then that's what enables me to use that as, look, we have water here. I can prove it. I have a drill stem test.

Now, would it be nice to have ten drill stem tests out here? Absolutely. But most people aren't going to go and shoot what looks like water to them on the log as well. Correct?

I'm not sure I'm answering your question, but I'm trying to explain to you my logic. I can do it with one well, but if I do it with one well and that well is way downdip, and I don't have an updip well, then I see your point. You come up here to this Beaza Well, and you can't tell me this is going to be 100 percent water, you're right, I can't.

But the fact I have a well updip of that that calculates 100 percent water, now I can tell you with a reasonable amount certainty that when you drill this well, it's probably not going to contain hydrocarbons.

Now, this process will be fulfilled because we will actually, once we drill the well, we will have the logs and we are able to then run the calculation, similar to what we did on the up and downdip well, to ensure there are no hydrocarbons in the well. But we can't do that until we get the logs.

MR. AMES: To ensure there are no hydrocarbons in the well that you have just drilled?

THE WITNESS: Correct, but we will have to wait to get the log to be able to do that.

MR. AMES: In that one location?

THE WITNESS: Yes, in that one location, correct.

MR. AMES: How about to the extent to the dispersed plume?

THE WITNESS: Peter will talk about that.

MR. AMES: I'm wondering, you said when you drill the well you will know if there is hydrocarbons there or not.

THE WITNESS: Correct.

MR. AMES: But what about the plume, what can you say about the plume?

THE WITNESS: In terms of hydrocarbons.

MR. AMES: Yes.

THE WITNESS: I'm not sure I understand your question because you are going to be injecting water -- I'm not sure I understand what you are getting at. I'm happy to answer, I'm just not sure I understand your question.

MR. AMES: I'm trying to get a sense of how reliable your dataset is.

THE WITNESS: I believe the dataset is reliable enough to, you know, working from a downdip to an updip, that direction, effectively with the well being, you know, we'll call it the center of the wells I looked at, it's in the middle, and I've got wells that are downdip that are wet, I've got wells updip that are calculating wet, unless there is a reason for there suddenly to become hydrocarbons in the middle, what I have seen from the offset wells, I don't see that as being any kind of real risk.

MR. AMES: Thank you.

THE WITNESS: You bet.

MS. BENNETT: May I ask one redirect question?

HEARING EXAMINER COSS: You may. Yes

REDIRECT EXAMINATION

BY MS. BENNETT:

Q. So I have up here Slide 55, and putting aside, if this weren't an example of the Groningen effect.

A. Yes.

Q. If you got this slide, these logs, could you tell from this one log whether there -- and this is a log, an offset log that you are evaluating for a potential oil and gas producer.

A. Yes.

Q. Could you tell from this one log, if it weren't the Groningen effect, that there could be hydrocarbons in the area?

A. From this one log I would be really a bit skeptical because I have the large washout, so I would be a bit skeptical about the data quality on this one log, so -- to answer that question.

Q. All I'm really thinking about is the middle part there.

A. Yeah, if I had this one log and I was confident that I had good quality porosity data and good quality resistivity data, if I were to compute this, I would calculate 100 percent water on this well.

Q. And conversely, though, if this were -- I guess

I'm trying to help answer Mr. Ames' question, which I'm not doing a very good job of either. I think what he was trying to get at was, if you were called upon by an oil and gas operator to evaluate whether a well, so you have an offsetting well --

A. Right.

Q. -- and they want to put in another oil and gas a mile away --

A. Yes.

Q. -- and you have one log --

A. Yes.

Q. -- could you tell from that one log whether -- could you run a petrophysical analysis based on one log to determine whether there could be hydrocarbons?

A. Yes, but there is still the geological component involved.

Q. I understand that.

A. Yes. But, yes, I could evaluate this well, if -- and as I evaluated this well it's 100 percent water saturated. And you know, now, does that mean the other well I'm drilling is going to be 100 percent saturated, again, that becomes a geological question. And as a petrophysicist, you know, I would have to go with the geologist to really get to the basis of that. But, you know, that one well, yes, I could determine if this one well is wet, which I have done, I think, with a reasonable determination in this case.

Q. But you said also --

A. And I've done it with multiple wells.

Q. You could also use one log to determine whether there is hydrocarbons?

A. Yeah, at the end of the day, absolutely, yes. I do that regularly for my clients.

Q. Yesterday when we were talking, I asked you or we were talking about who most of your clients are, and you mentioned most of your clients are actually petrophysicists.

A. Yes.

Q. Why is that?

A. So they always ask me, "Where do you get a lot of your work from?"

I'm like, "Ironically enough, other petrophysicists," and everybody kind of looks at you funny. And it's simply because most petrophysicists don't like to do petrophysics. It's funny because a lot of people are engineers and they end up being put in as petrophysicists and they would rather do the engineering side. I actually enjoy doing the petrophysical side.

A lot of times I get guys who are capable of doing the petrophysics but they end up having me do it because they don't like to. I actually enjoy it. Goofy from that respect, I guess.

MS. BENNETT: Thank you. I don't have any other redirect questions.

HEARING EXAMINER COSS: Okay, thank you.

THE WITNESS: Absolutely.

HEARING EXAMINER COSS: Do we need an hour or an hour and a half for lunch?

MS. BENNETT: Well, I mean, an alternative approach would be to continue to work for the next 20 minutes and finish and I will be done. But otherwise, I think given the proximity of restaurants we will probably need an hour and 15, is what I think, split the baby a little.

But we could also, subject to my witness' stomach, I think we could also -- and your stomachs -- continue to work and try to just knock it out before we go to lunch.

HEARING EXAMINER: Yeah, why don't we take an hour and 15 minute lunch since it's just -- we will aim for an hour and 15 and see what happens.

MS. BENNETT: Okay. Thanks.

HEARING EXAMINER COSS: We will see you in an hour and 15 minutes.

(Lunch recess was taken at 12:07 p.m. The proceeding resumed at 1:20 p.m. as follows:)

HEARING EXAMINER COSS: It's now 1:20, and we'll be with the hearing on record in Case Number 20985.

MS. BENNETT: Thank you.

At this time I would like to call my last witness Dr. Peter Jordan.

PETER WILLIAM JORDAN

(Sworn, testified as follows:)

DIRECT EXAMINATION

BY MS. BENNETT:

Q. Dr. Jordan, will you please state your name for the record?

A. Peter William Jordan.

Q. For whom do you work and in what capacity?

A. Lonquist, and my job title is senior scientist.

Q. I like that, senior scientist.

A. Kind of comes with the letters after my name.

Q. Are you familiar with NGL's application filed in this matter?

A. Yes. Yes, I reviewed it.

Q. Have you previously testified before the Division?

A. I have.

Q. When was that?

A. In August of last year.

Q. And were your credentials as an expert in

petroleum geology accepted as a matter of record?

A. Yes, they were.

Q. Have you been working in the field for some time?

A. Yes. Let's see, now it's going on 25 years.

Q. And what was your role in evaluating NGL's slurry injection well?

A. I took the information from the, from the geologist, Mr. Jessee, and Mr. Davis, the petrophysical analysis, and -- and entered it into a computer model to project pressurization and fluid migration with the, with the intent of projecting the spread and -- both laterally and, and primarily below the injection interval, the -- the Bell Canyon and the Upper Cherry.

Q. Have you had experience doing reservoir modeling before as a part of your work with Lonquist?

A. Yes.

MS. BENNETT: At this time I would like to tender Mr. Jordan as an expert in reservoir engineering and petroleum geology.

MS. BADA: No objection.

HEARING EXAMINER COSS: He is so recognized.

MS. BENNETT: Thank you.

BY MS. BENNETT:

Q. Before we talk about the model that you used -- or before we actually dive into the slides that are for your

study --

MS. BENNETT: I did want to just point out that, as with the other witnesses, there are materials in the hard copy than I excerpted for the presentation, so if there is anything you want to dive into more deeply in his materials, let us know.

BY MS. BENNETT:

Q. But I did want to talk about, even before we look at your study, some of the parameters that you used in preparing your study. For example, how many barrles per day did you use in your study?

A. I selected the maximum rate that was requested, 20,000 barrels per day.

Q. And did you select that rate for every day?

A. Yes. Every day, 24-7 for the entire 20 years.

Q. So your model extends out to 20 years?

A. Correct. Uh-huh.

Q. And did you also take into account the nearby proposed Beaza Well in your modeling?

A. Yes, I did, and their maximum rate request is similarly 20,000 barrels per day, and so that was -- the model is -- is composed of -- it's three dimensional so it's composed of layers and it extends laterally. So with that model you can place an offset well injecting whatever you want. And so I did that and had the, had the

Milestone Well also injecting for the full 20 years at the maximum rate.

Q. Would you say that your modeling is fairly conservative then?

A. Yes, it's very conservative.

Q. Okay. Is your reservoir engineering study behind Tab 4 of the materials?

A. It is.

Q. Okay. And what is the model that you used for your study?

A. I always call it SWIFT. That's an acronym for Sandia Waste Isolation Flow and Transport Model. It was developed at, at Sandia Labs and other, other institutions I think contributed. It was developed primarily in the '70s, 1970s, 1980s, initially with the, with the intent of evaluating migration of radio nuclei from proposed waste repositories.

Since then it's become the standard for, certainly with the federal government, for projecting plume migration of hazardous waste because that's one class of injection wells is Class 1 injection wells in the terminology to -- when they are injecting hazardous waste, you need to project migration of that waste for 20 -- for -- excuse me -- for 10,000 years in the future. So you need a fairly sophisticated model, and one that takes in the details of the geology, and so SWIFT has always been the standard that the federal government would accept for that kind of evaluation.

Q. And have you been using SWIFT for the -- during your 20 years of -- or in the 20 years it's been in place?

A. Yes, yes.

Q. So you are familiar with SWIFT as a modeling tool?

A. Oh, yes, definitely.

Q. Okay. So the first few pages that I haven't put on the screen are the parameters of more indepth discussion of the parameters that you used to then generate the slides that we are going to show on the screen?

A. Correct.

Q. So if anyone -- we can talk about any of those, especially in response to some of those specific questions that were asked earlier, but let's talk about the slides first, and then we can come back and talk about the modeling. Or would you -- it's totally up to you. What do you think makes more sense?

A. Let's see, I think we can go in and look at the results and see.

Q. Let's take a look at the results. So the first slide I put up is Page 74 in the materials. There's a lot going on here, so why don't you walk us through what this

slide is?

A. Yeah. This slide is, is -- maybe my voice will spread better, too, if I stand up -- depicts pressure rise in the seven-model layer. The top model layer is the Bone Spring, and then the Cherry. You can look on the -- on the overblown legend, and you've got Bell Canyon at the top, Upper Cherry Canyon in the middle, which are the -- basically the extent of the completion, the lower extent of the completion for the proposed well.

And there is the Lower Cherry Canyon, a silt stone, it's well defined, and Mr. Jessee gave -- identified that as a significant layer, and Mr. Davis' petrophysical analysis showed also that there was a section with much less permeability than the remainder.

And then there's the Brushy Canyon, and -- and, again, it's because of the -- that, that history of one well clipped to the Milestone, I figured that was the layer that was, was of interest to check what's going on there, and then the Avalon shale below. So there's these seven layers, and seven layers plus pressures in the actual wellbore of the, of the proposed NGL Striker injection well.

Okay, so we have eight curves. And the dotted -- the dashed curve is showing pressure rise in the formation for the entire 20 years of the projected service life.

The green is then ambient pressure close to the well. And so on downward, blue is the Upper Cherry Canyon, and then we are getting to the green, it's -- the green is down here covered up, partially covered up, and for the Lower Cherry Canyon and so on and so on down.

So clearly most of the pressure build-up -- there's the green right there, sorry. So the majority of the pressure build-up is where the injectate is actually entering the formation, and then it tails off as you go further down until you get to the Brushy Canyon, which is, as said, I felt was of particular interest.

And there after 20 years, it just -- as most, you know, most conservative assumptions about the injection rate, after 20 years the pressurization is only 7.1 psi.

That's about it. So this serves to talk about the, the vertical structure of the model, how the Delaware Mountain Group was divided out and then show the pressure projection.

Q. Just so I'm clear, the Avalon shale, which is sort of like a tealish colored line, maybe, doesn't even show on your tell delta pressure change because it doesn't even exceed -- it doesn't rise to the level -- it's like non-detect on your chart?

A. I chart it here. I mean we are talking about 1500 psi, so at the -- the change in pressure in the Avalon shale shows right here, 4 psi.

Q. Over a 20-year period?

A. Right, yeah. And it's just within the one line just because of the vertical scale on the plot.

Q. And is what you're representing here is the change in pressure over time?

A. Correct.

Q. So that 7.11 psi in Brushy Canyon, is that delta P over time?

A. Correct, above the original.

Q. Above the original?

A. Uh-huh.

Q. And again, this model takes into account -- or does this model take into account the Beaza Well also?

A. It does.

Q. And it takes into account the Striker 4 Well at full capacity?

A. Both of them at full capacity.

Q. Okay, thank you. Anything else that you would like to mention about this slide?

A. No, I think that's it.

Q. Okay. Thank you. Okay. So the next slide that we have then is on Page 75, and can you describe for the examiners what this slide shows?

A. I apologize, it's kind of kind of fuzzy. The --

these are pressure contours, so here's the Striker Well in the center. And as you inject there's pressure as the -- pressurization as you're introducing the fluid into the -- into the injection interval. And it's greatest pressure are at the center right around the well.

Again this is 20 years, full rate. And tails off from there's a 300 psi contour, and then down, and the last one I, I plotted was 150 psi contour. And kind of for scale and interest because it was the biggest, the widest contour, I quote the radii, you know, 9800 feet in the Bell Canyon where the majority of the fluid would be going, and 9400 feet in the Cherry Canyon, which is less porous, less permeability, just accepting less fluid.

So other things to talk about on this. So the Cherry Canyon is more narrow than the Bell Canyon. Another thing to talk about, why did I pick 216.4 psi, that's -- basically it's fairly standard, not so much in this regulatory program but for Class 1 wells to identify an area where a hypothetical open wellbore, the fluid could be forced from the injection interval up to the base of the drinking water or the underground sources of injection USDW. You may have heard that term.

And in this case with the density of the fluid involved and the pressure changes involved, turns out 216.4 is what will push the brine up, heavy brine up to the USDW, that change in pressure, so I delineated that.

And the radius is in the report. I should have put it on the drawing, but the radius is three-quarters of a mile. And just going to get a -- an accurate number -- yeah, yeah, 3950 feet, okay, and some change.

And so that would be -- I mean, that's within the area of review that was established before, and it just gives us an estimate of, of if where you might want to be looking at the wells. Yeah, uh-huh.

So, let's see. I think that's all I have to say on that one.

Q. Were there any open wells within that half mile of review or three-quarter mile area of review?

A. There was a well with a single plug, and it would have been filled with mud, and so that would be protected -- adequately protected in this case.

Q. And just for clarity for the record, the blue circles are the radii for the Bell Canyon?

A. Correct.

Q. And then the orange circles are the radii for the Cherry Canyon?

A. Correct.

Q. So this slide actually shows the pressure rise in both the Bell Canyon and the Cherry Canyon over time?

A. Correct. Correct. I knew there was one more thing. Let's see, where is it? Oh, yeah. Okay, again, I'm reiterating how small the pressure increase is in the Brushy Canyon and the pressure increase in the -- in the layers below were similarly just in the 10 psi range.

Q. And again this, the -- the conclusion that we see on this about where the 150 ps -- the pressure increases and the 216.4 pressure increase, that's at the 20 year mark; right?

A. That's correct.

Q. That's not the day it starts injecting?

A. Correct. It is not.

Q. Okay. And then this slide, like your other slides, takes into account the Beaza Well?

A. It does, yes.

Q. And Beaza Well applies for maximum rate, which is 20,000?

A. Yes.

Q. And also the Striker 4 max rate?

A. Max rate.

Q. So this again would be a very conservative model?

A. Yes.

Q. Okay, thanks. So then this is the final slide that we have for the screen.

A. Right. And just make sure I get the numbers right. Yeah, this then shows the -- this, the extent of the map is the same as what you saw for the pressure. But this is the extent of the plume from the, from the Striker 4, and it's -- and the model and in real life, there's a, a process called dispersion where as you are pushing fluid out from the wellbore, there will be a smearing of that front as it moves away from the wellbore. And dispersion is the process that describes that smearing in the front.

So there's a core right next to the wellbore that's, that's pure injectate. A cylinder growing moving out from the wellbore, and then dispersion off -- ahead of that, that full grunt of material. So we get a gradient, and so I chose the 1 percent contour. One percent is a, is a concentration relative to whatever is in that injectate that is -- that you designated as being 100 percent and -- and given the concentration is one percent of whatever that injected concentration was. So it, again, the contour on that smeared dispersed front.

And so anyway, in the radius in the Bell Canyon for, for the full rate and full duration of 20 years ends up being 1400 and change by a quarter mile, and the Cherry Canyon being less receptive gets less of the fluid, and so it's only 20 -- 273 feet radius from the wellbore.

None of the layers below the well, although, you know, the modeling allows for vertical migration also, but none of the layers below the main completion of the well got any concentration above 1 percent, so there was nothing to map on this scale.

Q. So based on your modeling there was, even though you input data, there was nothing to model because there was no migration, vertical migration?

A. A very tiny amount, in the -- the next couple of layers it gets down into the 1000ths as opposed to -- this is 1/100 and this gets down into the 1000ths and 10000ths with each layer.

Q. Okay. And again, the legend is the same, the orange color that you have there, that's migration with or the plume spreading after 20 years in the Cherry Canyon?

A. Correct. Correct.

Q. And then the blue is, at the 20-year mark, how far once it might have spread over 20 years?

A. Correct. In the Bell Canyon.

Q. In the Bell Canyon?

A. Uh-huh.

Q. Again, this takes into account the Beaza Well?

A. It does.

Q. And NGL's Striker 4 at full capacity?

A. Correct. Correct. And at the distance of the Beaza Well, now there's a slight asymmetry, the Beaza Well drives it a little bit that way, but it's -- it's a very small effect.

Q. And so based on what I will admit is a very rudimentary understanding of what you just laid out, which is very great -- your thing is not rudimentary, my understanding is rudimentary -- but are you saying that over 20 years the fluids that are being injected into the NGL Striker 4 would only migrate out less than or just about a quarter mile after 20 years?

A. Yes.

Q. So if there were hydrocarbons in that area which you heard Dr. -- Mr. Davis' testimony that he doesn't believe there are hydrocarbons in that area, but if there were, your plume, your modeling shows that it's unlikely they would be affected or that the plume is only going to travel a very short distance from the wellbore?

A. That is correct. Yes. Uh-huh. Yeah.

Q. Over time, even over time?

A. Uh-huh. When you say 1 percent -- I should never ask a question I don't know the answer to, but I'm about to do it -- are you using 1 percent because you want to have a very conservative measurement? So you are saying, even if 1 percent goes into that, even if 1 percent migrates out that far, I want to know about it. Is that sort of what what your modeling is like.

A. Yeah, I felt it was a conservative pick. You know, when you are talking about injecting, injecting a slurry, which, you know, I don't -- there is nothing in the slurry that I really can picture, although I'm not -- I don't know the chemistry of hydrocarbon production, but it seems like a 1 percent is going to be a minor, you know, have a minor effect, if any, so yeah.

Q. All right. Based on your study, is there any possibility that -- or is there a likelihood that NGL's proposed well would fracture the Bell Canyon or Cherry Canyon or the Brushy Canyon formation?

A. No. Because the -- well, the default in surface injection rate -- excuse me -- injection pressure of .2 psi per foot of depth is very protective on the fracture basis, at the very top of the formation the anhydrites are very sound, and you get very little pressure, the pressurization at the base of the injection intervals, which for sure is not going to exceed any fracture pressure.

Q. In your opinion is there a possibility of slurry migrating -- I think we've already talked about this -- below vertically to the oil producing zones in say the Avalon or the Bone Spring.

A. Certainly not at the 1 percent contour -- concentration level. You know, potentially in the parts per million level, maybe, but that dispersion is sort of a theoretical, you know, extrapolation based on -- based on real empirical data, but mathematically it's extended out.

Q. That sort of reminds me of that mind-bending thing about, if you move halfway from here to the wall, and then halfway from here to the wall again, and halfway from here to the wall again you actually never reach the wall.

But I actually will run into the wall at some point, though, I've tried it.

Earlier there were some questions about the porosity values at the well site. Is that in your study?

A. It is, yes, on Page -- Page 67 of the packet.

Q. Uh-huh.

A. There's a -- there's a Table 1 which lists parameters for the -- for each of the layers, model layers, and the -- and what I needed for my model was, was an average, assumed to be consistent throughout the layers. That's a requirement of the model, and these porosities were taken from Mr. Davis' petrophysical analysis of a -- of a particular well, and the API number is in parenthesis just below the table.

Looking at this sentence right now, I realize that the word southwest is in error in this. It's actually W/NW from the, from this well. It's actually -- it's that well right there. The one that was on the end of Mr. Davis' cross-section.

Q. So this table on Page 67 shows the porosity, sort of an average porosity --

A. Correct.

Q. -- in each of the formations?

A. Uh-huh. And, and as you can see, the highest porosity and permeability is in the Bell Canyon. Upper Cherry, it's starting to tail off. There's a section in the middle of the Cherry Canyon that has -- that had -- visually had lesser, lesser porosity. So -- so I pulled that out as a layer to include in the model. And then the Lower Cherry Canyon again with somewhat lower porosity and so on, uh-huh.

Q. Great. I think that might be all the questions I have for you right now. Is there anything you wanted to talk about in terms of your report or any other information you think is important for the Examiners to know about your report?

A. Let's see. I think we pretty well covered it. Yeah.

Q. Okay.

A. We can go on.

MS. BENNETT: Well, with that, then I would request the admission of Exhibit 4 into the record.

MS. BADA: No objection.

HEARING EXAMINER COSS: Exhibit 4 is so admitted.

(Exhibit 4 admitted.)

MS. BENNETT: Thank you, and I will pass the witness.

HEARING EXAMINER COSS: Great. Thanks for your presentation of the model and description -- oh.

MS. BADA: I don't have any questions.

HEARING EXAMINER COSS: Okay, thank you. The description of the software used, so my question -- so I see on Page 67 that you give us the model, model input tier. The Bell Canyon you have modeled at 926 feet of gross thickness with 12.7 percent porosity?

THE WITNESS: Correct.

HEARING EXAMINER COSS: Is that uniform 926 feet of 12.6 percent porosity?

THE WITNESS: Well it's either uniform -- well, real formations of course, there are, there is heterogeneity, so the model is -- the model does assume it's homogenous because one has to break space into the intervals, but it's -- the results would be pretty similar if you broke it, if you broke that porosity thickness product into sections with higher porosity and sections with lower porosity that had an equivalent porosity thickness product.

HEARING EXAMINER COSS: And was the 926 feet the total thickness of the formation, or is that the -- the thickness that they picked out just like it's a section of the interval --

THE WITNESS: It is the total thickness of the formation, and the porosity is the average porosity -- average affected porosity, so it's a conservative, low estimate of porosity.

HEARING EXAMINER COSS: Are we assuming then that the whole thickness is going to be accepting the fluid and that the whole thickness of the formation would be perfed?

THE WITNESS: That's the way this model is set up, yes.

HEARING EXAMINER COSS: I see. So hypothetically there is actually going to be less than 926 feet of total thickness?

THE WITNESS: Correct. However, once one gets away from the wellbore, there's going to be vertical exchange so it, it will -- fluid will tend to fill in the remaining thickness just by virtue.

HEARING EXAMINER COSS: Is that based on the geology of the formation or typical or --

THE WITNESS: It's based on the permeabilities, the distribution of permeabilities that I see there. They vary over a certain range, but it's not like -- there is nothing that is just within that Bell Canyon that is, that is an extremely low porosity and permeability, so there, there -- there would be some vertical exchange, you are talking about the presence possibly of stringers and little shaley streaks and whatever.

HEARING EXAMINER COSS: Well, I'm not thinking of shaley streaks, but this was deposited over millions of years and there's going to be shale beds continuing across -- did I hear there was going to be continuous shale beds that were across the entire formation?

THE WITNESS: Mr. Jessee is nodding, so yes. Yeah. We have to make an assumption on model.

HEARING EXAMINER COSS: Sure, would the result be any different than if we had several layers that weren't continuous and thinner intervals since we are assuming that 926 is a maximum estimate of effective porosity?

THE WITNESS: 926 is the total growth thickness.

HEARING EXAMINER COSS: Of the formation?

THE WITNESS: Correct.

HEARING EXAMINER COSS: Not including -- without having to subtract out the shale?

THE WITNESS: That's correct, yeah.

HEARING EXAMINER COSS: Okay. And 12.7 percent -- and then there's actually going to be many intervals with higher porosity that will be taking more of the fluid than areas with less porosity?

THE WITNESS: Right, necessarily on an average like that, there is going to be some that are much -- yeah, with an average there are points above and below the average yeah.

HEARING EXAMINER COSS: Would it be -- I guess I'm thinking about it in my mind and wondering if you could model it if there was a situation where say a high porosity zone was -- had been -- for ten years had been taking most of the fluid and ten years out is filled with drilling mud.

THE WITNESS: Right.

HEARING EXAMINER COSS: And then we are resorting to lower porosity intervals, could we have a situation where on a big day we, in one of these smaller intervals, perhaps fracture some of this interval?

THE WITNESS: That, as far as fracturing, no, because that's pretty -- because the -- the maximum surface injection pressure pretty much protects against that because if it's plugged -- if it's plugged and they are still trying to inject, then the injection pressure is going to go up and hit the maximum, and then they have to reduce their rate. So I don't see fracturing involved or really any, any preferential pressurization that would, that would reach fracture pressure.

HEARING EXAMINER COSS: I see. Perfect. Okay, well, moving on from that, I had a few questions on just the explanations on some of the slides, but now I flip all the way to Page 74 and was seeking a little bit of explanation on the -- it would be the -- at what distance are we saying that the pressure change will be such and such stated psi away from the wellbore?

THE WITNESS: Well. Let's see. 74 is -- it's basically a -- the way the model is constructed, it's a stack of seven blocks, okay. The well is injecting into the first two. So the well is introducing fluid into the top two of the blocks, and then the remaining, I'm sorry the top three blocks. I keep getting that number wrong the top three blocks, and so the -- so -- and so then for the blocks below, the pressure -- the pressure change that you see is from vertical migration from block to block, and so these pressures are for, in any one of those blocks, are at the mid point of the block, and they are representative of the average. They are gradient, but they are the average, their pressure at the mid point of an individual block in the model.

The one exception is the dashed, the dashed curve at the top, that's -- that's within the wellbore. That's pressure in the wellbore, so -- and it's, it's evaluated in the model at the mid point, mid point depth of the top block that it's completed in, which is the Bell Canyon in this case because the Bell Canyon is the top of the completion interval.

HEARING EXAMINER COSS: Okay. So this is talking about vertical migration of the fluid?

THE WITNESS: Well, this is talking about pressurization over time.

HEARING EXAMINER COSS: The X kind of up-down pressure.

THE WITNESS: Well, that's -- the up-down pressure is the difference between each -- the differences of each of these curves and this is, you know, through time, it's a time projection and there's the wellbore in the mid point at the depth of the mid point of the Bell Canyon, but it's in the wellbore. And then the blocks that that wellbore is placed in is 83 feet by 83 feet by 926 feet tall, and so the, the next curve down is the mid point of that block, and it -- it's just outside the wellbore because it's reflecting the average in that block.

HEARING EXAMINER COSS: I see, and that's assuming that we have the continuous porosity permeability without any baffles.

THE WITNESS: Yeah, correct.

HEARING EXAMINER COSS: Does that take into account the impermeable layer just above the anhydrates?

THE WITNESS: The model is sealed. There's zero porosity, zero permeability above. So that means that all the pressurization, all of the plume migration is, at least on a big scale, is constrained between the, the base of the Avalon shale in this case because that's the last on the model, and the base of the anhydrates, yeah.

HEARING EXAMINER COSS: Okay. And continuing on, I'm going to ask for more explanation on the slide on Page 75.

THE WITNESS: Uh-huh.

HEARING EXAMINER: So this 216.4 number that you mentioned, could you explain that to me a little bit more, that's the fluid column --

THE WITNESS: Right. Yeah, okay. And it's -- if I don't explain it clearly, it's evaluated on the Pages 70 through -- yeah, 70 through 71, also. But in the, basically in the simple or summary, I guess you would say, the question is, how much -- what does the pressure have to be in the formation for that heavier fluid to be lifted up a hypothetical wellbore.

HEARING EXAMINER COSS: Straw down there within the zone.

THE WITNESS: You have an open straw down there, right.

HEARING EXAMINER COSS: It would force the fluid up.

THE WITNESS: Right. Yeah. Okay. So that, and then -- and that's then relativized to the original formation pressure that's -- so for instance, on Page 70, the first equation, Equation 1 to be critical, in the jargon, that's that 216.4 psi pressure rises, it's the pressure to, to drive the brine from the injection interval up to the USWD minus the original pressure that was there already, yeah, uh-huh, yeah.

HEARING EXAMINER COSS: Okay, I see. And this has everything extending perfectly radial in our kind of 916 foot, or is this for all three layers of the model?

THE WITNESS: This is, this is for the ones that show that had any -- any visible contours on the scale. They were the -- the third layer done had some pressurization, but it was just, you know, inches from the wellbore, so it was -- because the Bell -- because the Bell Canyon is taking the lion's share of the fluid, yeah.

HEARING EXAMINER COSS: I see. Well, I guess I won't keep going down the path of quizzing you about whether we think it will actually extend out radially --

THE WITNESS: The logging will tell a tale, and to the extent that the characteristics really vary, and if there is a shale, a shale streak, you know, shale layers that bound a particular interval, and they turn out to be thick, then you would expect that, yeah.

HEARING EXAMINER COSS: I guess I'm wondering if the sandstone layers that you might encounter at the wellbore are going to be horizontally contiguous, if you know, a quarter of a mile away, or if --

THE WITNESS: Right, yeah.

HEARING EXAMINER COSS: Or if they could be -- and if we have a strange shape that will -- not a perfect circle; correct?

THE WITNESS: Right, yeah, that's certainly a possibility.

HEARING EXAMINER COSS: Okay. In your mind, would it be possible, say we start there's a 12 percent or 15, 16, 18 percent sandstone that seems to be taking all of the fluid, would that have a potential to migrate much further than this to pressure up further away?

THE WITNESS: If you assumed that, that none of the fluid was dispersing into the layers above and below, yes, it would be a matter of projecting based on the log or log information, were those -- how impermeable were those shale layers.

Because as soon as you get out into the formation and you are expanding the plume, all of a sudden you have an awful lot of surface area above and below. So even if you have a low permeability shale, there is some surface area that can deplete the plume rapidly, even by molecular diffusion into the layers above and below.

HEARING EXAMINER COSS: Okay, I will buy all of that. And I feel like I have exhausted my questions.

THE WITNESS: Okay.

HEARING EXAMINER COSS: So thank you. I will pass you to Eric, then.

MR. AMES: Good afternoon, Dr. Jordan.

THE WITNESS: Uh-huh.

MR. AMES: I have a couple of questions for you. You testified you don't know the chemistry of the injectate; right?

THE WITNESS: The -- all I know is that it's a brine, and then there are -- and then solids, and yes, that's all that I know.

MR. AMES: So you don't know the chemistry of the injectate?

THE WITNESS: Correct, yes.

MR. AMES: You stated the effect of 1 percent concentrate levels would be minor, in your view.

THE WITNESS: Uh-huh, yes. I will define that.

One percent, and again it's -- it is a judgment, but 1 percent is, as far as my knowledge of the behavior of fluids is something, something that is 1 percent concentration of the main fluid is not going to affect its physical properties very much.

MR. AMES: Would you agree, though, that if you don't know the chemistry of the injectate, you are just speculating as to its effect.

THE WITNESS: That, yes.

MR. AMES: Okay, thank you. I would like to ask you a couple of questions about the modeling. You testified that you have testified before in New Mexico; is that right?
THE WITNESS: Uh-huh, yes.
MR. AMES: You testified before the OCD or OCC?
THE WITNESS: It was, it was before this group for the, for modeling done for the Milestone Beaza Well, the neighboring well.
MR. AMES: Was that your sole testimony in New Mexico, or have there been other times.
THE WITNESS: It's my sole testimony, yeah.
MR. AMES: Okay. In the Beaza case, did you use the same model as you are using here?
THE WITNESS: In that case, in that case I had extended -- I had taken in the Bone the upper portion of the Bone Spring, so one more layer down, and I treated the Cherry as a homogenous -- you know, honestly I'm -- that I don't honestly remember, but I know that I took in the Bone Spring, and -- yeah.
MR. AMES: That's fine, I'm not asking you questions about what you modeled specifically, but which model you used.
THE WITNESS: Yes, the same model, SWIFT. Yeah.
MR. AMES: Have you used that same model in other states as well?

THE WITNESS: Yes, uh-huh.
MR. AMES: I assume that would also be in the context of saltwater disposal wells. Saltwater disposal well, acid gas disposal well, hazardous waste injection wells, I think that pretty much covers it, yes.
MR. AMES: That's quite a lot about how many times have you used this model in support of testimony?
THE WITNESS: In support of testimony, that would be -- let's see. You mean where I actually came in for a hearing, you are asking?
MR. AMES: Yes. Yes. Roughly, not an exact number.
THE WITNESS: Between five and seven, I can't recall, the majority in Texas.
MR. AMES: Okay. For any of the wells that you ran this model for here in New Mexico or in Texas or any other state, was there any, to your knowledge, any monitoring or measurement of the dispersion of the plume over time?
THE WITNESS: It's not something that one can directly measure in a typical well situation, so no, no.
MR. AMES: So the model has been used, but it's never been, in your experience, for the wells that you worked on, it's never been confirmed that the model is correct?

THE WITNESS: No. Huh-uh, no.

MR. AMES: Okay, thank you.

THE WITNESS: Uh-huh.

HEARING EXAMINER COSS: That's it, unless you want to ask another question?

MS. BENNETT: I don't think I have any redirect at this time -- oh, yes, actually.

REDIRECT EXAMINATION

BY MS. BENNETT:

Q. So you have been here throughout the day today listening to the testimony --

A. Right.

Q. -- from all the witnesses? And it's your understanding, or is it your understanding that NGL does not seek to use this as a produced water or saltwater disposal well?

A. That's not the primary intent, no.

Q. And so although we inadvertently -- or intentionally but inappropriately labeled all the application materials saltwater disposal well, it's actually going to be a slurry injectate well?

A. That's correct.

MS. BENNETT: Okay, thanks. I have no other redirect at this time. And with that --

HEARING EXAMINER COSS: Thank you, Dr. Jordan.

MS. BENNETT: At this time I would like to remind myself to talk about the notice affidavit. Behind Tab 5 is the affidavit of notice that I prepared showing that I sent letters, including the application for this case to affected parties, and that letter was sent on December 18, and it gave notice of today's hearing.

I also included the application, and I included with my materials an affidavit of publication showing that publication was timely done on December 21, 2019, and so the notice packet is complete.

Also included in the notice packet, I should say, is the list of parties to whom I sent the notice, as well as the status of the mailings.

So I would ask that Exhibit 5 be accepted into the record for Case Number 20985.

HEARING EXAMINER COSS: Exhibit Number 5 is admitted into the record.

(Exhibit 5 admitted.)

MS. BENNETT: Thank you. I have nothing further.

HEARING EXAMINER COSS: Okay. Well, thank you. I guess at this point we'll call the witnesses from the Oil Conservation Division.

MR. DAVIS: I don't know if you ever asked the state if they wanted to cross Peter.

MS. BADA: Yes.

MR. DAVIS: I wanted to make sure.

MS. BADA: I have one witness, Phillip Goetze.

HEARING EXAMINER COSS: Please stand and be sworn.

(Oath administered.)

MS. BENNETT: There's a cable.

MR. GOETZE: That's okay, it's your computer. You can disconnect.

MS. BENNETT: One point of -- just a point of clarification before we start with Mr. Goetze's testimony. I have two witnesses that have a 5 o'clock plane, so with the Division's permission, I would ask that they be allowed to leave the proceedings.

MR. AMES: They are excused.

MS. BENNETT: I don't intend to recall them.

HEARING EXAMINER COSS: I don't either, so you may be excused.

MS. BENNETT: Thank you both for being here.

MR. DAVIS: Want to talk about petrophysics more and bore you more.

HEARING EXAMINER COSS: I will reach out and be looking for those pages.

MS. BENNETT: Thank you.

PHILLIP R. GOETZE

(Sworn, testified as follows:)

DIRECT EXAMINATION

BY MS. BADA:

Q. Please state your name for the record.

A. My name is Phillip R. Goetze.

Q. Who is your employer?

A. I am currently employed by the Oil Conservation Division working in Santa Fe in the Engineering Bureau.

Q. What is your position?

A. I am the designated UIC manager and I'm also a geologist and hydrologist for the Bureau.

Q. What you are your responsibilities as a UIC manager?

A. Majority of my effort is involved with the review of C-108 applications and applications involved for injection, including acid gas wells, enhanced recovery projects and disposal wells, all Class 2.

Q. Have you testified before the OCD previously?

A. Yes, I have. The latest OCD appearance was June 28, 2019. I can also throw in Commission on December 11, 2019.

Q. Were you accepted as an expert regarding permitting of UIC wells including hydrology and petroleum geology?

A. Yes, I was.

MS. BADA: We ask that Mr. Goetze be recognized as an expert in the field of petroleum geology and underground injection.

MS. BENNETT: No objection.

HEARING EXAMINER COSS: Mr. Goetze is so recognized.

BY MS. BADA:

Q. Have you reviewed NGL's C-108 application for the Striker 4 SWD Number 1 well?

A. Yes, I have.

Q. Do you have any concerns regarding that application?

A. Well, following the review with the original application, OCD generally disfavors approval of UIC Class 2 wells for disposal in the Delaware Mountain Group, but OCD has made considerations for situations where the disposal activity is either related to the operation of surface facilities which support oil and gas operations or where we have an operator who has a limited need for disposal and is isolated from a general disposal system.

The original C-108 application came in as applicant has noted primarily describing a saltwater disposal well. With the testimony given today we have learned that this well is going to be in support of a facility. Applicants's exhibits 1-5 to 1-C have roughly described a treatment facility which is associated with removal of fluids from cuttings which is similar to the application that was made by Milestone in Case Number 20657.

And as a side note I do support the Division's request for additional information on the AOR wells since you can hardly read the list. Four wells were identified. A fifth well was included, but it is only the bottom hole location which is in the AOR one-half mile review. And I would note that in Red Hills, historically the horizontal wells in this area age to the early days of the first type of horizontal well so that the cementing in this area is irregular.

So I would ask that, that the applicant provide the additional information so the confirmation of proper cementing and therefore the penetrations are not an issue with this application.

Q. Why does the OCD generally disfavor UIC Class 1 wells in the Delaware Mountain Group?

A. We look at the Delaware Mountain Group as one of the original disposal intervals, especially going back previous to the horizontal well development. At this time we disfavor the use of it for commercial disposal produced water, one, based upon a demonstration of low formation fracture pressures that we have seen with numerous wells already in existence and those that have gone off line, you might say, and have pressured up. We have also seen with that impacts to production in Delaware Mountain Group's lower formation, the Brushy Canyon, and, in some cases, the Avalon shale.

The second thing that we are concerned about was the increase in pressure in the Delaware Mountain Group which introduced a new factor of drilling complications. We have seen this at several locations where cement has been washed out and joint programs have had to change significantly to include new mud programs, new casing designs in order to meet the obligations to drill deeper into the target intervals which is the Permian with its Bone Springs and Wolfcamp formations.

And three, in some locations where the Delaware Mountain Group occurs, we have contact with shallower occurrences of underground drinking water sources, mainly the Capitan Reef where drilling through the Reef into the Delaware Mountain Group has raised a level of concern and, therefore, for those locations we are very, very aggressive in making sure that the cement program and the casing program protects that underground source of drinking water.

Q. After hearing today's testimony and reviewing the application, what is your view of this NGL Striker 4?

A. At this time with the information provided here and the testimony given, the OCD will not oppose the application with the inclusion of the following recommended conditions:

One is to do an initial step rate test to determine formation plotting pressure prior to commencing injection.

Two, approval of maximum surface injection pressure will be based on either the administrative gradient of 0.2 psi per foot to the top of perforation, or unless determined by the step rate test demonstrates a lower pressure gradient is necessary.

And I will remind the OCD that our determination of maximum pressure is a reduction of 50 psi from that determination of the formation parting pressure.

Three, limiting the volume of daily injection to less than the rate required to fracture the interval as determined by the step rate test. We would also ask the Division to consider a limit of 10,000 barrels per day based upon the variety of information as to what is being actually injected into the well until such time as the demonstration of the step rate test.

Four, the proposed well can only be stimulated with acid frac without the use of proppants.

Five, injection authority for the proposed well will be as active as long as the facility that it supports is operating under an approved permit.

Now, there have been several indications that it is in the same classification of the facility as what's been proposed for Milestone. They have applied for a surface waste management facility, which has a ten-year cycle. I would stipulate that the injection authority for this permit be allowed to a -- well, be limited to a ten-year period at which a renewal could be applied for before its expiration, and with that application would come a new step rate test to see what the current formation.

Let's see. Six, monitoring of proposed well will be included in a SCADA system.

Seven, applicant will run mud log and associated geophysical logs for correlation of stratigraphy and reassess the economic evaluation for hydrocarbon potential presented at hearing today. This reevaluation, I would recommend, be provided to OCD prior to any injection.

And I would also suggest to the OCD that it include in any order that it writes the ability for this to be administratively done without coming to hearing. That includes changing depth of the completed interval based upon the geophysical logs.

And finally, if the operation of the proposed well, while under approved to inject has increased in excess of the maximum surface injection pressure indicating that it has reached the limits of the formation, that the authority to inject for the proposed well be terminated and the well be plugged and abandoned.

These are conditions that were similar to ones proposed by the State Land Office in its presentation before the Milestone case, and these are items which have been included with other DMG wells that have been approved lately for small operators.

Q. Is there anything you would like to --

A. That's it. Thank you.

MS. BADA: I pass the witness.

MS. BENNETT: No questions.

HEARING EXAMINER COSS: Well, thanks, Mr. Goetze, that's very helpful. The only question I have for you is if you would care to speculate as to why more so than other formations the Delaware Mountain Group has a low parting pressure?

THE WITNESS: That is because as Nance's paper points out, its diversity, it is unique, and with it comes the ability to have a variety of opportunities with turbidite structures as well as sloped deposition. It is an interesting fact that we do have correlation issues with the Delaware Mountain Group.

Most of the information that comes together is derived from operators making their own models and their own selections. Having talked to the folks at the New Mexico Bureau of Geology and Mineral Resources, correlation is a big issue in this area. And we have, again, many approaches as to why you would be going into the Delaware Mountain Group, but our history of injection has shown that in many cases, even the .2 exceeds the formation parting pressure and that we've had to lower injection, maximum surface injection pressures as a result of step rate tests. So we tend to want to approach this with more of an actual measurement as opposed to what we have seen historically.

HEARING EXAMINER COSS: Wonderful. Thanks. That's my only question. Mr. Ames?

MR. AMES: Yes, I have five pages of questions. I actually just have one question.

So what can you say about OCD's experience with predictions regarding plume dispersion for saltwater disposal wells in the Delaware Mountain Group?

THE WITNESS: We have had mixed results. The extent to what we have heard today is unusual, but historically, we have had numerous applications in which models have been presented only to have fallen apart when we have received a, an inquiry from an adjacent operator who has seen production drop off as a correlation when injection hasn't started with an adjacent Delaware Mountain Group.

I would also supplement that with we understand as a division the DMG has become a hot issue in many aspects because of the fact of the growing capacity for disposal, and with that, the reason for us going to deeper formations at this time as the Devonian and the Silurian for disposal for commercial operations.

MR. AMES: You said that the modeling falls apart. What's that mean?

THE WITNESS: Modeling falls apart because we end up seeing horizontal wells watered out, that the actual characteristics of the formation for instance, in the Bobco cases, the presence of a fracture system was not identified until Bobco made additional drilling, but with that, the presence of that fracturing system was not taken into consideration when the Delaware Mountain Group wells were approved, and with it, it showed up as a means for moving beyond what was originally presented as the limiting effect for those disposal wells.

MR. AMES: When you say a means for moving beyond. It almost suggests that someone is doing it. Is that what you are suggesting, that someone is actually trying to exceed is the scope of the AOR?

THE WITNESS: Not necessarily. What I'm stating is that through the operations and parameters that we award the permit on, we would later find out there were other downhole conditions that were not known about or assessed.

MR. AMES: So you would say that the modeling was not accurate?

THE WITNESS: Well the modeling was accurate for what you have, but at the same time, that's why we try to get more information. So the modeling works well with what information it does have. So sometimes it works and sometimes it does not work well.

MR. AMES: Okay. Thank you.

MS. BENNETT: May I ask a follow-up question based on your questions?

HEARING EXAMINER: Yes, you may.

CROSS-EXAMINATION

BY MS. BENNETT:

Q. Thank you for not opposing with the conditions that you laid out. I appreciate that. And apologies for any unnecessary concern by the way I labeled the application. That's on me.

A. Don't look at me. It's them.

Q. But I did want to talk about the mud log, and I'm not saying anything about that as a condition, but wouldn't that address some of the concerns about when the modeling falls apart, for example, because you have the actual data? OCD would have the actual data to determine whether there are hydrocarbons within that, at least the wellbore, the area proposed to be the wellbore because you will have the

actual data?

A. You would see that in all our wells where we have any questions that we do request that additional testing be done. Historically the DMGs were done through either just blind drilling, and in many cases it was open hole, and so no consideration.

But then again, this is the dynamics of how the situations change. When those were done vertical wells were consider the only model for development. The Delaware Mountain Group with the Brushy Canyon became very economical in some locations with the advent of horizontal drilling.

And right now we are fracturing solid rock, which we considered impossible as source material and productive material, so, yes, we try to obtain the best information, so that's why we would include that condition.

Q. So you have already sort of thought through a process in your mind that would --

HEARING EXAMINER: Ms. Bennett, just a reminder to keep your questions within the scope.

MS. BENNETT: I am. This had to do with the question about the modeling falling apart and how OCD is able to track what happened post modeling.

Q. And so my question really is that, OCD in this case, if this order were approved and if this recommendation were included, OCD would be saying, before you even inject,

you need to give us evidence of the step -- you need to do a step, step rate test, and also the mud log and another log that I didn't have a chance to write down, but in your opinion, anyway, those would -- or is it your opinion those would sort of help minimize the effect of a model falling apart or falling away or not being able to accurately predict the downhole situation?

A. After all of these questions, yes, we always want to have downhole information. And we do similar things for acid gas wells, and again, we do the Devonian. We do ask that you log it. And in that case, come back and look at your evaluation and see if that model still sticks together.

Q. So you are imposing on NGL essentially -- I'm trying to ask questions that are positive, not negative -- so you are essentially imposing on NGL a second check, a real check on the modeling?

A. That's true.

Q. Yeah.

A. And there I would also bring to light that the Beaza is one of two wells that have been proposed for that area. So there is a likelihood based on historical that we will have multiple wells in this area, and so -- especially if the characteristics turn out that this well can support this facility -- and I do remind the applicant that in its solid waste management facility application for the north, that it includes a discussion of liche removal as using a disposal well. So there are many things that have been decided as a means of disposal, so I'm sure we may see several wells by the time these facilities are done.

MS. BENNETT: Thank you.

THE WITNESS: You are welcome.

HEARING EXAMINER COSS: Well, for that you may be excused, Mr. Goetze.

THE WITNESS: Thank you.

HEARING EXAMINER COSS: Would the parties like to present a closing argument?

MS. BENNETT: I will make a very brief closing statement which is that NGL ask that this case be taken under advisement. And as I mentioned a moment ago, I appreciate Mr. Goetze's thoughtful approach to this.

And as the evidence demonstrated today, at least the modeling which is the best that we have right now, demonstrate that there won't be any -- that there are no hydrocarbons in the area, that there is very little likelihood of fracturing the lower formations and there's no -- really very little, if any, impact on correlative rights, so there is no impediment to granting the application.

So for that reason NGL would ask the Division take the case under advisement and grant the application.

Thank you.

HEARING EXAMINER COSS: Thank you.

MS. BADA: We would just ask that you consider the conditions that Mr. Goetze has suggested.

HEARING EXAMINER COSS: Very well. Thank you. And so with that, we will take Case Number -- the Division take 20985, NGL Water Solution's for a Water Disposal Well -- or Slurry Disposal Well under advisement.

MS. BENNETT: Thank you very much. Thanks for your time.

HEARING EXAMINER COSS: That concludes the hearing for the day.

(Case 20985 taken under advisement. Adjourned.)

STATE OF NEW MEXICO
COUNTY OF BERNALILLO

REPORTER'S CERTIFICATE

I, IRENE DELGADO, New Mexico Certified Court Reporter, CCR 253, 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 of attorneys in this case and that I have no interest in the final disposition of this case.

Dated this 9th day of December 2019.

____
Irene Delgado, NMCCR 253
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