DNR HEARING - HENNING MGMT. VS CHEVRON DAY 3

STATE OF LOUISIANA

DIVISION OF ADMINISTRATIVE LAW

****

DEPARTMENT OF NATURAL RESOURCES

NO. 2022-6003-DNR-OOC

IN THE MATTER OF

HENNING MANAGEMENT, LLC V. CHEVRON U.S.A., INC.

****

PUBLIC HEARING

BEFORE THE HONORABLE CHARLES PERRAULT

Taken on Wednesday, February 8, 2023

DAY 3

(pages 517 through 791)

Held at the DIVISION OF ADMINISTRATIVE LAW

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(PROCEEDINGS COMMENCING AT 9:05 A.M.)
JUDGE PERRAULT: All right. We're on the record. Today's date is February 8, 2023. It's now 9:05.
I'm Charles Perrault, administrative law judge. I'm conducting a case in Baton Rouge at the Division of Administrative Law. The case is from the Department of Natural Resources, Office of Conservation. It's Docket Number 2022-6003, in the matter of Henning Management LLC versus Chevron USA Incorporated.
This is the third day of the hearing. All parties are present. I'd like them to make their appearance on the record.
We'll start with Chevron.
MR. GREGOIRE: Good morning, Your Honor, panel members. Victor Gregoire for Chevron USA.
MR. GROSSMAN: Good morning. Louis Grossman for Chevron USA.
MR. CARTER: Good morning. Johnny Carter for Chevron USA.
JUDGE PERRAULT: And for Henning?
MR. CARMOUCHE: John Carmouche on behalf of

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Henning Management.
MR. WIMBERLEY: Todd Wimberley on behalf of Henning Management.
JUDGE PERRAULT: And I'd like the panel to make their appearance on the record. Just state your name and your agency.
PANELIST LITTLETON: Jessica Littleton, Department of Natural Resources.
PANELIST DELMAR: Christopher Delmar, Department of Natural Resources, Office of Conservation.
PANELIST OLIVIER: Stephen Olivier, Department of Natural Resources, Office of Conservation.
PANELIST BROUSSARD: Gavin Broussard, Department of Natural Resources, Office of Conservation.
JUDGE PERRAULT: And, Mr. Olivier, you're the panel chair -- or the panel coordinator; is that right?
PANELIST OLIVIER: Yes, sir, that's correct.
JUDGE PERRAULT: All right. It's Chevron still presenting its case, so please call your next witness.
MR. GREGOIRE: Thank you, Your Honor.

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Chevron's witness is David Angle.
JUDGE PERRAULT: All right, Mr. Angle. Come forward.
And please state your name for the record.
THE WITNESS: David Angle.
JUDGE PERRAULT: And spell your last name.
THE WITNESS: A-N-G-L-E. Like right angle.

DAVID ANGLE,

having been first duly sworn, was examined and testified as follows:

DIRECT EXAMINATION

JUDGE PERRAULT: All right, Counsel, please proceed.
MR. GREGOIRE: Your Honor, as we have done in the past, we have a hard copy of Mr. Angle's presentation, his slide deck today, and we will give you a hard copy and the panel members. We're given counsel a copy.
JUDGE PERRAULT: All right. Thank you.
MR. GREGOIRE: And we've also provided copies electronically.
BY MR. GREGOIRE:
Q. Good morning.
A. Good morning, Mr. Gregoire.

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Q. Can you state your name?
A. David Angle.
Q. And, Mr. Angle, by whom are you employed?
A. Environmental Resources Management. It's a large environmental company. I'm based in Houston, Texas.
Q. And what is your position at Environmental Resource Management?
A. I'm a geologist, hydrogeologist. I do a lot of site investigation and remediation projects. And I've worked really all over the country. I've been focused in Louisiana for a long time.
Q. And if you can speak up a little bit --
A. Sure.
Q. -- just so that the court reporter can transcribe and everyone can hear you.
How long have you been employed at ERM?
A. At ERM, I originally started in 1988. I worked there eight years. I left to join Michael Pisani & Associates. And then Michael Pisani & Associates was acquired by ERM in 2018, so I'm back at ERM. So total experience ERM-related is about 35 years.

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Q. Can you give the panel a description of your educational history and then, from that point, a summary of what you have done at ERM and the other companies with whom you've been employed since college?

A. Yes. Certainly. My qualifications there are on the screen. I have a bachelor and master's degree in geology, undergrad from University of Delaware, and master's from North Carolina State. Continuing education in hydrogeology from Wright State University.

One of the things that I also do is take short courses every year to kind of keep up with the latest on-site investigation and remediation techniques. For example, I just attended a groundwater week in December. National Groundwater Association puts that on.

All of the water well drillers and scientists that deal in groundwater come to that. And I attend the technical talks, basically their investigation and remediation. It keeps you up with what's going on across the United States relative to groundwater site investigation and remediation.

And then obviously I've got 35 years of

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site investigation and remediation experience. I started my first experience working in Louisiana in 1990 on a large oil refinery site up in North Louisiana and really have been working in Louisiana extensively since then.

A lot of experience, obviously, working with some of the panel members historically over time, DEQ as well.

And then finally, my original training was in the EPA Superfund program, working on some of the most complex sites in the United States. In my early days learning kind of from the ground up on the investigation side, how do you deal with these sites and then ultimately how you remediate them.

And so that experience is relevant, you know, kind of broadly across a lot of the -- you know, the routine site investigation and remediation experience that we do on a day-to-day basis, including, you know, investigating oil field sites like we're here to talk about today.

Q. So, Mr. Angle, you have considerable experience and expertise through your education, training, and job experience in the area of environmental site assessment, evaluation, and

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remediation of various onshore sites, including oil and gas sites?

A. That's correct.

Q. Okay. And you've been accepted as an expert both in regulatory hearings like the one that we're here for today and at trial; is that right?

A. Yes, that's correct.

Q. And what areas have you been tendered in, as we call it, and accepted as an expert?

A. These areas here on the screen. Site assessment or site investigation, remediation, geology, hydrogeology. Soil and groundwater fate and transport, and that's basically evaluating and looking at the movement of fluids in the subsurface as well as groundwater.

And then finally, application of regulatory standards. In this case in particular, we focused primarily on 29-B and RECAP, but we also look to EPA and Sanitary Code, and radionuclides. You'll hear some of those in a little bit.

Q. Explain to the panelists and the judge a little bit about your professional licensure.

A. Yes. My first license was issued in

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1996 by the American Institute of Professional Geologists. Way back then, a lot of the states didn't have state certifications. And so that was '96.

In 1998, the National Groundwater Association, which is the conference I just went to, instituted a program for groundwater professionals and you submit publications and references and everything and basically, you know, kind of keep up with what's going on in groundwater. I was certified in '98 by them.

And then my first certification here in the Gulf Coast was in Texas in 2003, Mississippi in 2010. And then, of course, in Louisiana, the PG program just was instituted in 2014, and I got licensed to do work in the state at that time.

Q. And you alluded to it earlier, but you have considerable experience in Louisiana in investigating, evaluating, and determining whether remediation is warranted under the applicable regulations at oil field sites; is that right?

A. That's correct. And, you know, as you see in the slide deck, over 75 oil and gas field sites. And I think, if you look across the state, in the parishes, I've probably worked in half of

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the parishes in the state in different oil fields.
And some of these sites are litigation, some are before litigation, during litigation, post-litigation. Three Superfund sites in Louisiana, 20 other Louisiana sites that are, you know, various types of sites.
And, you know, finally, I would say probably 80, 85 percent of my experience has been in the state of Louisiana since 1990.
Q. Okay. You've worked with LDNR and LDEQ as well in various contexts in connection with the investigation of oil field sites throughout your career; is that right?
A. Yeah, that's correct. And, you know, the panel probably -- some of the members have heard me before in some of these hearings and, whether it be in a hearing or just, you know, day-to-day regulatory work, I've worked with the panel members.
Q. And you've testified in four trials which involve Act 312 or legacy oil field sites; is that right?
A. Yeah, that's correct. And the first one, Marin -- I'll just reference the two here -- that dates back to 2007. That's the case that

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went up to the Louisiana Supreme Court. I provided testimony on the groundwater in that case.
And then the most recent case that was tried was Hero Lands, and I provided testimony in that.
Q. Tell us a little bit about your work with the LDNR work group whose purpose was to determine guidance on boreholes and monitoring systems.
A. Yeah. I got asked to serve on that work group back in 2016, 2018 time period to help work on revising the handbook that provides guidance to install environmental boreholes and monitoring systems.
And I was just one of a team of members to provide technical expertise on that document, which ultimately was finalized in 2021.
And so that was a group of technical professionals bringing our experience from different views and then trying to revise that book which was a little bit out of date.
Q. You've remediated numerous oil field sites that are under the oversight of the Louisiana Department of Natural Resources; is that

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right?
A. Yes, I have. And I think the -- you know, in my interactions with the panel on some of those -- or panel members or previous panel members, I guess.
Q. Next we have the Act 312 public hearings in which you have been involved, such as the one that we're here today and this week, and we have eight different matters, Act 312 hearings, that are on your chart here.
Can you explain in which of those you've been personally involved through testimony or otherwise?
A. Yes. The first seven on this list, I provided testimony at. The first one here is Tensas Poppadoc. That was probably one that maybe some of you have heard. That was 2009. That was the first Act 312 case.
And the most recent one that I've been involved in before this one was Drew Estate. The Savoie, I assisted -- I didn't provide technical testimony, but I had assisted on that one.
MR. GREGOIRE: At this point, Your Honor, I will offer and file Mr. Angle's curriculum vitae, which is identified as Chevron

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Exhibit 146.
JUDGE PERRAULT: All right.
MR. GREGOIRE: And I would also tender Mr. Angle as an expert in the following areas: Site assessment, remediation of environmental media, geology, hydrogeology, soil and groundwater, fate and transport, and the application of the applicable regulatory standards and procedures.
MR. CARMOUCHE: For the purpose of this hearing, Your Honor, I do not object, and I will reserve my rights to cross him on the information.
JUDGE PERRAULT: Okay. He's accepted as an expert in those, I think, seven areas you just stated.
MR. GREGOIRE: Thank you.
BY MR. GREGOIRE:
Q. So, Mr. Angle, it might help the judge and the panel members. Can you provide a summary or a road map of the areas about which you will testify today?
A. Sure. The first bullet here on the screen is a summary of expert opinions. I have, I think, about a half dozen kind of summary

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opinions. We'll talk about the regulatory standards, what regulatory standards did we apply.

I think you've heard from some of the other experts and probably heard -- I think Ms. Levert or Dr. Connelly talked a lot about RECAP. I'll talk about 29-B and a few others. Talk about groundwater classification and quality. I think you've heard a little bit about that. We're going to hear a lot more about that from me. And then, finally, I'm going to present the Chevron most feasible plan.

Q. Thank you.

So what are -- give us a summary of your expert opinions. We think this would be helpful for the panel before you delve into your analysis.

A. Okay. I think the first one here is important. Soil meets Statewide Order 29-B and RECAP standards protective of human health and the environment.

Ms. Levert -- and I sat through her testimony yesterday -- went through her whole RECAP analysis, looking at soil, looking at some of the issues that she was asked about.

But I also looked at it from a 29-B perspective. And from that perspective, you know,

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I compared the data to 29-B in part of my analysis, and we'll get into, you know, some of that in a little bit.

Q. And your second opinion is what?

A. Soil remediation's not required based on our multidisciplinary review. And I would encourage the panel to not only look at our report, there's a specific section on remediation plain in the back, but within the report, there's references to reports that are attached, like Dr. Connelly's, Ms. Levert's, Mr. Richard Kennedy on -- he's an E&P expert. Mr. Patrick Ritchie. And then Dr. Shawn Kind -- or Dr. John Kind and Dr. Shawn Wnek. They're the toxicologists.

So all of those documents are attached as part of our most feasible plan. So when we say "multidisciplinary," it's not just David Angle saying that no soil remediation is necessary, it's bringing in expertise from those other experts when we come up with a remediation plan.

Q. And what is your next opinion, Mr. Angle?

A. Groundwater is naturally poor quality and nonpotable. I'll show you some data and information to support that. Obviously, I think

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you saw a slide in Mr. Purdom's deck where he showed you the available sources of water to the property. I'll cover that again just to tie in this Number 3.

Q. And your next opinion is?

A. Groundwater is Class 3 and meets RECAP standards protective of human health and the environment. Ms. Levert obviously did a full RECAP analysis, but I did the classification of the groundwater.

Q. And what is your last opinion?

A. Groundwater monitoring proposed for benzene in one area. We'll talk about that. As I think Ms. Levert pointed out, there are two locations, two wells right in the immediate vicinity of the blowout, that have some low levels of benzene.

As the panel members probably know, that benzene routinely degrades in the environment and it's widely studied, well-known across the U.S., and so we're looking at a monitoring evaluation of that benzene similar to -- for those of you familiar with East White Lake, did monitoring there to look at the attenuation of benzene.

Q. Now, is the methodology that you have

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used, Mr. Angle, in arriving at your opinions in this case similar or consistent with the methodology that you have used not only in evaluating other Act 312 cases that have come before a hearing in the Office of Conservation but also matters that fall outside of litigation and that relate to site assessment, evaluation and remediation of oil field sites?

A. Yeah. I think the key thing there is, you know, litigation kind of sits over what we do but it doesn't change what we do. So we do site investigation and remediation, we look to the 29-B or RECAP standards, and so whether we're talking here today or we're talking about a site on a day-to-day basis, we use that same framework and process to investigate and remediate sites.

Q. Are your opinions based upon the rules and regulations that LDNR's Office of Conservation has applied in other oil field matters?

A. Yes. Yes. I mean, they're pretty much the same across the board on these sites that we work on that I'm sure the panel members are familiar with.

Q. And have your opinions taken into account the methodology that the Office of

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Conservation and the panel members such as we have here today have used in arriving at most feasible plans in other matters?

A. Yes, most certainly. We are following the same procedure or, you know, one could call it a cookbook, I guess, but it's a pretty well-documented procedure that we follow.

Q. Let's talk about the regulatory standards that apply to the Henning site, or the Henning property.

What we have here, it's a definition --

A. Excuse me. Can we go back to that slide? This might be just helpful for panel members. For those of you that aren't that experienced with drilling equipment, this is a geoprobe work rig that was used to advance some of our soil borings and monitoring wells. And it's on tracks, it's fairly mobile.

If you haven't been in the field, it's kind of an interesting piece of equipment to see. But it has the ability to collect continuous soil samples so you can visually see soils. And in this case, we went down to 78 feet. And so we can describe the soils. It's also used to put in monitoring wells.

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And then the landowners' consultant has a similar piece of equipment they use to push a conductivity probe, and you probably heard Mr. Purdom talk about electrical conductivity probe. This is a similar piece of equipment that is used to kind of do a lot of the sampling work.

I mean, some of the shallow sampling work was done with a hand auger, but this piece of equipment's pretty important to us relative to investigating typical sites.

Q. So let's move to the regulatory standards. And you start with the definition of evaluation or remediation; is that right?

A. Yes. And this is, you know, straight out of Chapter 6 here, and I called out a couple paragraphs here. And it basically provides us with a definition, what is evaluation and remediation? So it's a word, and we've got to gather data to evaluate what to do with the data in terms of evaluation and remediation.

So as it's defined here in 29-B, it's included, but not limited to, the investigation, testing, monitoring, containment, prevention, or abatement, and so it includes a wide variety of things.

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And we have evaluated those and presented a most feasible plan that includes components of what's defined as evaluation or remediation.

Q. And, Mr. Angle, when you read those definitions in Chapter 6, are you reading those definitions in the lens of a technical expert with scientific expertise in the evaluation of oil field sites and how to arrive at a proposed path forward that's based on sound science and regulations?

A. Yes. We always do because we gather data and we evaluate our data, as well as the opposing parties' data, ICON's data in this case. We look at all that.

But the only way to arrive at decisions regarding, for example, remediation, you have to evaluate the data relative to a regulatory framework or a -- come to a decision on remediation. And that is guided by data and the scientific process, and that's what I do.

And I think you've probably heard testimony the last day or so that that's kind of what we do, we look at the scientific data to evaluate the need for remediation.

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Q. Then next you have the feasible plan definition. And what bears to you in that definition in Chapter 6?

A. I think probably the thing that we have highlighted here is what's termed the most reasonable plan. And I've been involved in these back to Poppadoc, and I think the word "reasonable" and "feasible" are important words in the environmental remediation industry.

And so if you have -- and you can go all the way to EPA guidance from the 1980s. If you have two remedies that are equally protective, you want to look at some other things and not -- and so that's where reasonable and feasible comes in. And we'll talk a little bit more about that.

So -- and when you look at the previous MFPs, obviously feasible and reasonableness have come into play relative to remedy selection.

Q. And when you see most reasonable and feasible plan, are you evaluating that definition in the lens of a scientist who applies the science regulations and the methodology that you typically employ in these cases in arriving at a recommendation for these oil field sites?

A. Yes. Because we base all of our

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opinions and evaluation on the data. If we didn't have data, it's very difficult, or I'd argue impossible, to determine whether you can evaluate or remediate a site relative to a state or a federal regulatory program. So we have to have the data, and we use that to come to our opinion relative to remediation.

Q. So next, we'll move to Statewide Order 29-B, Chapter 3. Can you describe why that has relevance to you and why you're here today?

A. Yes. Obviously Chapter 3 provides us with soil standards, and they were primarily developed for pit closures. And for upland and wetland areas -- as you probably heard, the majority of this property's an upland, there is one area that's been defined as a wetland.

We looked at those, and I think you heard there really aren't any open pits out here, so there's no -- we're not talking about, you know, reclosing any pits.

We also looked at effective root zone. When I say "we," again, this is this interdisciplinary team. That was Mr. Patrick Ritchie and Dr. Luther Holloway. And they look at the salt stand- -- or I look at the salt standards

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relative to their evaluation because those are agronomic standards.

And then finally, we looked to prior DNR decisions relative to soil in 29-B. There's just some examples here. The most recent one I've been involved in was the Drew Estate. Couple of the ones there at the end, Agri-South and Sweet Lake, I was not personally involved in them -- in those, I was aware of them. Those are just some examples.

Then finally, as the panel well knows, there are no numerical groundwater standards in 29-B, so we have to look elsewhere for that guidance.

Q. Okay. So if we move back up to soils within the effective root zone, as you said, Mr. Holloway, who unfortunately can't be with us here this week, and Mr. Ritchie performed that analysis of the vegetation at this property; is that right?

A. Yeah, that's correct.

Q. That's the only root zone analysis that you have seen and that has actually occurred at the property, at the Henning property; is that right?

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A. Yes. Mr. Ritchie and Dr. Holloway's root zone study, we're the only party -- or the Chevron side is the only one that conducted those root studies.

Q. So let's move next to the soil standards under Chapter 3 of 29-B.

A. Sure. These are the, obviously, 29-B pit closure standards. And I spent a lot of time with them. These are the metal standards. They're also salt standards, which we'll talk a little bit more about those. But these are the metal standards.

One of the interesting things at this site is that we don't have any exceedances of these 29-B standards. You heard a lot of talk about barium in the last couple days, but the barium was total barium, it wasn't true total barium. We don't have any exceedances here of true total barium.

And these other metals, we don't have any 29-B exceedances. And I forgot to mention oil and grease. We don't have any oil and grease exceedances. Over 650 soil samples from over, I think, 100 soil borings, no oil and grease exceedances.

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Actually, I think Ms. Levert only identified three indications of potential TPH, so that's important, too. So we don't have 29-B oil and grease and we don't have 29-B metals exceedances.

Q. As your slide indicated earlier, 29-B does not include numerical groundwater standards as it does for the soil; is that right?

A. Yeah, that's right. And this is just a quote right out of 29-B, "Contamination of a groundwater aquifer, USDW, with E&P waste is strictly prohibited."

So what does that tell us? That's kind of a -- 29-B was written in 1986. It's kind of a -- it's not really a forward-looking regulation. So if it's prohibited but you find it, it doesn't give any guidance on what to do about it or what to compare to it. And that's where we look to RECAP.

And so we look to RECAP relative to numerical standards because they're risk-based standards that postdate 29-B and they're more modern, as I think Ms. Levert testified to.

Q. And as we know, the Office of Conservation has applied RECAP in analyzing prior

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oil field sites under Act 312; is that right?
A. Yes, that's correct.
Q. Now, one other item of note under the groundwater provision, if we move next, is the exception provision. Sorry about that.
So explain to us what this means and what your experience is in connection with an exception to the 29-B rules and regulations.
A. Yes. This is, again, straight out of 29-B, "The commissioner may grant an exception to any provision of this amendment upon proof of good cause."
So what that means to a scientist is that we have, for example, in this site, or this case, we have groundwater data. And so if you start back to when the first testing was done, ICON goes out and collects TPHd and O data. That's RECAP data you can only evaluate with RECAP. It's not oil and grease. And so we have to look at RECAP.
So that's what would be called an exception. It's a way for the agency to look to RECAP to evaluate data in a risk-based manner.
And my experience through all of these is that RECAP is looked to as an exception to 29-B

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relative to groundwater.
Q. So the Office of Conservation has applied RECAP to certain soil parameters in other contexts; is that right?
A. Yes. And -- I'm sorry. I want to say one more thing about exception. In our report, in Section 10, the remediation plan, we have provided the panel with a compilation of proof of good cause, demonstration of good cause of our request for an exception, for example, to use RECAP and those things because I know that has come up in the past and we wanted to be -- provide the panel with a summary of our request for an exception relative to demonstrating proof of good cause. So that's in Section 10. Sorry.
Q. And that's another way in which you have attempted to refine or to comport your opinions or to guide your opinions through the methodology that the agency, that is LDNR's Office of Conservation has used in the past; is that right?
A. Yeah, that's correct.
Q. So let's go back to RECAP and its application to non-Statewide Order 29-B soil parameters.
A. Certainly, yeah. As you heard

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yesterday, we have a data set. TPHd and O is a good example. Barium, not true total barium. We have to look to RECAP. Ms. Levert handled all that. But that's consistent with pretty much every oil field case I've been involved with where we look to RECAP.
We can't ignore RECAP data. TPHd and O is a great example. And so we have to use the RECAP program. And that's what Ms. Levert did.
Q. And again, as you mentioned earlier, there are no numerical groundwater standards under Chapter 3 of 29-B; is that right?
A. That's correct.
Q. So here, you have actual numerical groundwater standards under RECAP?
A. Yes. This is just a table out of RECAP, and I'm not going to get into RECAP other than just to tell the panel we look to RECAP relative to guidance on comparative standards. That's what Ms. Levert does.
We just highlighted this column in table 3 that identifies the GW 3 and DW standards which I think you heard Ms. Levert testify to as --
MR. GREGOIRE: Can somebody mute their phone

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who's on the network? Please mute your phone.
BY MR. GREGOIRE:
Q. Okay. Let's get back.
A. Sorry. So we looked at the Groundwater 3 standards here, but also importantly, in the RECAP manual, there's a section on groundwater classifications.
We need to look to RECAP on that guidance not only in the main document but in the appendices, in particular Appendix E -- I think it's E -- and F -- no. It's B. I'm sorry. B and F, and we'll look to those in a little bit.
But anyway, Ms. Levert did all the numerical analysis of RECAP, but we look to that in the RECAP document relative to classification.
Q. Okay. So next, we have the maximum contaminant levels and secondary maximum contaminant levels. How do they relate to the Office of Conservation's evaluation of groundwater?
A. Sure. For some constituents -- chloride is probably the best example -- there's no promulgated drinking water standard because I think Ms. Levert testified, or Dr. Kind, that

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obviously we drink tomato juice which has a lot of chloride in it.

But there are secondary standards for some of the things that we'll talk about today, chloride being one of them. Sulfate, I think prior a little talk about sulfate. Total dissolved solids and iron and manganese, there's secondary drinking water standards.

And so we've got to look to EPA, the EPA regulatory framework, to evaluate those. But that's consistent with prior DNR decisions and evaluations of oil field site data.

And then -- well, I guess, finally, Ms. Levert did an extensive analysis of soil and groundwater data.

Q. So next you have a summary of Department of Natural Resources most feasible plans. And what is your purpose of presenting this summary?

A. Yeah. The purpose here -- and we're not going to go through each one of these, so I'll comfort you there. But I think the primary purpose here is to just provide a little history of these hearings or these MFPs and what do they tell us.

And so going back to Poppadoc, it

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required additional soil sampling. But pretty much all the MFPs that have been issued have required that. In this case, you probably heard that we need some more delineation, so that's soil sampling.

Additional groundwater sampling -- let me use this pointer. Each one of them has included additional groundwater sampling. We have additional groundwater sampling in this plan and actually a monitoring program.

Work plan, that's a line item that the DNR has required for us to submit relative to their most feasible plans. Basically, you ask us: "Tell us what you're going to do." We don't have a plan yet, so we're not at that stage, but that's been typical.

A cost estimate. Going back to Poppadoc, typically the panel members or the previous MFPs have provided costs to do the actual evaluation or remediation where it's specified in the plan. We have that in our plan here.

RECAP is applied in our plan. You heard that yesterday, but that's consistent across the board back to 2009.

Root zone. One thing I'll say about the

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root zone, back in 2009 -- this kind of predates the root zone. As the science evolves, a root zone study started to be done. But early on, a 3-foot remediation depth for salt standards was looked to, and so that's why I point that out.

The subsequent ones here, we're looking at more site-specific root zone analysis like, you know, Mr. Ritchie and Dr. Holloway have conducted.

And then finally, on the groundwater remediation side, there really hasn't been any requirement to remediate groundwater to background conditions in any of these MFPs.

And so the reason we kind of put this slide in is to basically give the panel an idea just in a brief summary of some of these past MFPs. And our MFP that we have put together for the panel's review has used pretty much the same elements that these past MFPs have contained.

Q. So I want to move to the Savoie matter and the background groundwater remediation which you have checked. You worked on and assisted in that matter; is that right?

A. Yes, I did.

Q. There were some questions asked of Dr. Levert yesterday about the remediation of the

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groundwater that occurred in that case.

Can you give the panel the actual background of what occurred?

A. Yeah. And this is -- my understanding, after looking at the MFP is that at the end of the day, the MFP, in the decision-making process, the responsible party said, "Okay. We'll go attempt to do this remediation of this Class 3 zone." It was the responsible party. And I think in the MFP it says there might be a less intrusive or costly alternative. But the client, in this case it was an oil company, decided to go out and attempt to do this.

Well, moving forward up until, I think, the 2017-2018 period, to do that, a pumping pilot test well was put in to attempt to evaluate the feasibility of remediating a Class 3 zone. And through that process, it was determined that it wasn't feasible, so a background remediation of groundwater wasn't done.

And so, you know, that's an important step, is when you're evaluating a remediation, it's one thing to say we're going to go do this. It's another thing to say, "Okay. You've got to do a pilot test first," because if the pilot test

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is not successful, then just because you say you're going to go out and do this, you don't have any support for it.

So that's what was done, is my understanding of the Savoie that ultimately ended in, I believe, a no further action relative to groundwater.

Q. And that groundwater, as you said in that case, was Class 3 groundwater; is that right?

A. Yes.

Q. And that is, as we all know, water that's deemed unusable by rule and regulation; is that right?

A. Yes. And it -- and it kind of makes sense because -- and the panel will hear in a little bit, you know, I'm quite familiar with water well drillers and water well logs and everything and the practicality of using these shallow zones. It's just not there. And there's many reasons: Yield, dry conditions, susceptible to infiltration. Let's say you've got a septic tank down at 8 feet and you're trying to use a shallow zone at 15, doesn't make a lot of sense. Kind of those reasons.

And typically these zones, and you'll

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see in a little bit, are really fine-grain soils, silts. You'll hear -- I think Mr. Purdom talked a lot about silts. There's just not a lot of sand within these zones.

And water well drillers will typically look for medium course sands. They want to be able to provide enough volume of water to provide a meaningful well.

Q. So let's move to your next slide, which it addresses a visual summary of the regulatory standards.

And this is something that you put together as a demonstrative; is that right?

A. Yeah, that's right. It's kind of a little cartoon that -- it helps me, really. You know, you talk about all these regulatory programs, but where do they apply?

And so Mr. Holloway -- or Mr. Ritchie and Dr. Holloway talked about -- Patrick talked about an effective root zone. So that's up here, 29-B salt standards. That's where we are in that program, they're agronomic standards, so -- I think those are rice plants there. They look like rice.

Below that, in this case, we have a

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pretty low permeability, clay and silty clay, as Mr. Purdom talked about the other day. We've used green to define that.

29-B, obviously metals and the oil and grease standards apply at all depths. So let's say we have an exceedance of a metals or oil and grease, which we don't on this site. But if we did, it still applied down here in the deeper soil column below the root zone.

RECAP, we look to RECAP here, SPLP chloride for salt below the root zone to evaluate potential deeper movement.

And then we look to RECAP for non-29-B parameters. Probably the best example is TPHd and O we already talked about.

And then finally, we look to RECAP for what do you do about groundwater in a zone like this -- a silt zone that -- and I encourage the panel to look. There's four cross-sections in the report. The discontinuous nature of this zone. In some cases, it's thick or other cases, it may not even be present. And that's where RECAP comes in.

Q. So while we're on this visual summary, you understand what the current and historical

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uses of the property are; is that right?

A. Yes. I have -- I've looked at that pretty extensively. I've looked at Mr. Hennings' deposition. I've been listening to the testimony. If I wasn't in the room, I was listening. And I've heard all the testimony relative to current and potential future uses.

One thing to keep in mind is that this site has been -- started oil and gas production 80 years ago. And when you look at the aerial photos going back to 1940 which predate the first well, I think that Chevron was involved with, and you walk yourself through them -- and all those photos are in our report and the figures. It's -- the property's basically been used for the same thing for 80 years: Oil and gas operations, agricultural operations.

But as part of my evaluation, and others of our team, we've considered other potential uses of the property.

Q. What other potential uses of the property have you considered?

A. From -- I think Mr. Henning testified that, you know, this doesn't really make sense from a residential standpoint. As you heard

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yesterday, Ms. Levert looked at that scenario: Are the data protective of a residential setting?

I think I heard talk about, you know, digging a pond, comfortable digging a pond out on this property. You know, I think Mr. Ritchie touched on the agricultural uses.

You know, one of the interesting things about this property, it has what's called a pump-on/pump-off system. And if you -- well, the panel was out there. You might have seen the canal that comes on. They use Bayou Lacassine water, so you've got a large water source, you've got a big water well, it's great for irrigation. So I'm not a farmer or here to talk about that, but, you know, that's important relative to future uses of the property.

Of course oil and gas. You know, oil and gas production, there were 19 wells on the property. Oil and gas production comes and goes. Sometimes those wells get plugged. Sometimes down the road, they could get reentered, so...

But when you look back at the 80 years of record, that's kind of what you see from this property's use over time.

Q. So next, you have Title 51 of the Public

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Health Sanitary code. And describe and let the panel know why that title of the Sanitary code has relevance to you.

A. Well, it's a Department of Health code here, and it basically says that if you have a premise or a building within 300 feet of an approved public supply, you probably ought to make a connection if you want to use water.

And why is that? It's like, well, it's tested, it's potable, and it's -- won't go dry in the middle of the night if you have a shallow well. And I think, you know, from the -- if you look at it from the Public Health Different, they look at it as like we're trying to be protective of people to provide this potable water source that is tested. And so that's what this citation tells you.

Q. So next, we have the radionuclides rule; is that right?

A. Yes.

Q. And what bearing does that have in your analysis?

A. The radionuclides rule was promulgated in 2000 -- and I'm not a health physicist like Dr. Frazier, and I don't want to -- or claim to

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be. But I am aware of this rule, and I am familiar with radionuclides and radium testing in groundwater.

And what this tells you is, this rule in the MCL -- and you may have heard talk about the maximum contaminant level for combined radium 226 and 228 of 5 picocuries per liter in groundwater. That's the drinking water standard. And so where does that apply? That applies to community water systems that basically are a public supply.

This water-bearing zone doesn't serve or cannot serve as a public supply. And there's just a definition there for community water system: "Fifteen service connections regularly supply at least 25 year-round residents."

So we don't have that here. And it's also not applicable to noncommunity water supplies, kind of the same thing, that actively serve 25 or more of the same persons.

And so this is -- these are larger systems. I mean, they're not like the City of Baton Rouge's water system, but it might be a smaller town or a trailer park or whatever. This zone can't serve that, and so at that point, this rule does not apply.

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And then I think, finally, Dr. Frazier -- well, before we get there, you might ask, "Okay. What's the quality of this shallow water-bearing zone, how's that play in?"

Well, if it's nonpotable and poor quality, it kind of really doesn't matter. And in this case -- and I'll show you the data that demonstrates that.

And then finally, I think Dr. Frazier presented his evaluation. And if I didn't mention it, I believe his report's attached to ours as well as his evaluation of the radium data.

Q. Let's next talk about groundwater classification and quality and the rules and analysis that the Office of Conservation has relied upon in determining classification of groundwater.

First, you have the groundwater classification -- go back.

A. I'm sorry.

Q. That's okay.

A. I hit the wrong one. All right. Operator error. Sorry.

Q. So can you describe for us the RECAP rule on groundwater classification which is

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embedded in Section 2.1 of RECAP?
A. Yes. And I won't read this. I think the panel probably knows and Ms. Levert may have covered it. But a couple of the key points in RECAP, it tells you to identify water wells within a mile radius, and we did that and Mr. Purdom showed a map.
To evaluate the use, how is the groundwater being used, where is the groundwater being used, in this case, what depth, and then what is the natural TDS? And so we basically followed the RECAP manual for the classification work that we did on the property.
Q. So the first requirement under RECAP for groundwater classification is to perform a water well survey; is that right?
A. Yeah, that's correct, and that's kind of step one. And the red line represents -- you might say, "Well, that's kind of a weird shape." Well, we tried to be consistent with a mile boundary around the outer limits of -- it's about a 2-mile-square-mile property. You guys were out there. You know it's quite large.
And so we look at a quite large radius around that to identify water wells, and that's

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what we did. And as you can see, really on the property, those red symbols, those were old rig supply wells that have been plugged and abandoned. And there are a few domestic wells located up to the north. But by and large, not a lot of water wells on the property.
The one that Mr. Purdom introduced the other day, it doesn't show on this map. I've got a subsequent map that will show that well.
One thing that's on this slide that I probably ought to point out here up at the top, we actually contacted the water purveyor -- the name slips my mind right now. It's in the report.
What would it cost to tap into the public supply line, which is this blue line -- I'm sorry. It's not working.
Q. You can get up if you want to point, Mr. Angle.
A. So this blue line that runs basically along Highway 14, this cost to tap is -- 640 is the low end. I think a horizontal bore, they told us, to come underneath the highway would be the high end to tap into the public supply line. Of course, the public supply line kind of cuts right through the property, so it can provide service on

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both sides.
Q. So if Mr. Henning or any other landowner in this area wants a water supply, then that could occur through tapping into this public water supply system for $640 to $1790; is that right?
A. Yeah, most definitely. And when you look at the sanitary code, obviously this property's within 300 feet because the line goes through the property and so the line does serve the property.
Q. And that goes back to Title 51 of the Public Health Sanitary code that you testified about earlier?
A. Correct.
Q. So let's move to the next slide. And so this -- you've already testified somewhat about this, but can you summarize for the panel the results of your and your colleagues at ERM's water well research at this property and outside of it?
A. Yeah. Probably three -- three key things here. Probably the most important on this slide is these water wells are not completed in the shallow water-bearing zone that Mr. Purdom talked about the other day. That's number one.
Number two is that the Chicot that has

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been tapped underneath the property and in the vicinity, the shallowest Chicot well was 120 feet. Some of them were down 300-plus. And we'll get into the reasons why that is.
There's -- there is this one water well on the property that was tested in 2017 to produce 3500 gallons a minute. That's a lot of water, 3500 GPM. That's an industrial-type well or a municipal well.
The well was reported in good condition at 200 feet deep, 10 inches. Obviously that motor's not in order, but it's right by the well. And so that's a source of -- a large volume source of water. Let's say you wanted to fill your crawfish ponds. Instead of using Bayou Lacassine water, that would do it.
So if you wanted to build a big pond on this property, that would do it. A well in the shallow water-bearing zone won't cut it for those purposes.
Q. Where is that water well located at the property, do you know?
A. Yeah. I can -- I can -- I can use this slide. It's basically Highway 14. It's right off to the west of Highway 14. And I think at the

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end, ask me that question again and I'll point it out.

Q. So let's move next to groundwater classification. That's one of the other requirements of Section 2.10 of RECAP; is that right?

A. Yeah, that's right. And we did an extensive program to classify groundwater at this site. It started with our evaluation of ICON's slug test. They put in -- typically how these work is they'll go out and do their investigation work on soil and groundwater, we'll come behind them.

They tested five wells. We came behind them and put in a whole series of wells and, as you can see -- if you don't mind, I'll jump up here.

There's a whole series of wells. These ones that start with the "MW" prefix, those are monitoring wells that ERM put in. I think there's a couple Hs. Those are the ICON wells. That's their prefix.

On the right side of the labels are the well screening intervals. And so we looked at -- the water-bearing zone's kind of discontinuous,

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and so some of these wells are not -- they may have little variable screened intervals, but they range about from 30 down to almost 60.

And so we've got a group of 17 wells that have been slug tested. And you can see they primarily focused in the Chevron limited admission areas. We have Area 2, Area 4, 5, and 6.

Area 8's over here. You might ask why you have one over there. Well, that was a dry hole, really not much was going on over there. A little bit of barium in soil that you heard about.

And so the primary focus here are these areas right here, and that's where the aquifer testing or the slug testing was conducted.

Q. And the purpose of the slug testing is to determine maximum sustainable yield in the groundwater; is that right?

A. Yeah, that's correct. And we used, you know, straight out of RECAP, the confined well yield equation because this thin water-bearing zone has, you know, thick clay units both above and below it, and so that's the equation in Appendix F that specify the Hvorslev method for confined aquifers was used.

And again, I'd ask the panel to go -- we

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have a summary table with all of these -- you know, all of the calculations. So that's all provided, as well as the backup graphs for the slug tests.

And then we arrive at a geometric mean yield of about 398 gallons per day. If -- the Class 2-3 break is 800 gallons per day, so this is about half of that, so clearly it's in the Class 3 groundwater range.

PANELIST DELMAR: Mr. Angle, real quick.

JUDGE PERRAULT: Please state your name.

PANELIST DELMAR: I'm Chris Delmar. I'm on the panel.

With the variables on the Hvorslev, HC, what is that variable?

THE WITNESS: Good question. The HC is a confining head. So that's basically the column of water above the top of the water-bearing zone.

So, for example, if the top of the water-bearing zone is 30 feet below the ground surface and you've got clay above that, if you put a monitoring well in, how much water rises above that? In this case, the HC's a pretty large number, and so it's

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an important part of that equation.

And that's a good question. Another reason why is because if you can imagine going drought periods, like in the late fall, the HC tends to get lower.

And so you really want to understand that HC in really low periods of time because if you design a water well during a dry period and you rely on a calculation, you've got a problem. And so you really want to say, okay, how low can this zone -- you know, if this zone dries out over time, then that becomes an important parameter in your evaluation.

PANELIST DELMAR: I'm used to seeing it as HO minus H --

THE WITNESS: Yeah. And that's just straight out of RECAP. But yeah, it's the water column height.

PANELIST DELMAR: Okay. I just wanted to make sure.

BY MR. GREGOIRE:

Q. So you have support for your determination of a geo mean yield of 398 gallons per day, which is Class 3 at this property

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groundwater; is that right?
A. That's correct.
Q. We'll go to the next slide.
And what does this tell us? This a RECAP of Appendices B and F.
A. Right. And the reason why we showed both of these excerpts is to provide the panel with some information on how we look at evaluating a property this large with multiple slug tests.
And so what it tells us in Appendix B is that a slug test should be connected on an adequate number of monitoring wells that do not contain nonaqueous phase liquids. Well, we don't have any nonaqueous phase liquids. But what that implies is that when you have a large property like this and the variability in the geology, one slug test can be quite misleading, and so -- because of the variability. And so it tells you to, you know, look to a larger number. Obviously, we looked to quite a large number, 17, to try to be as comprehensive as we could in the areas of investigation.
Q. And you mentioned the expansive area of this property. Just to remind the panel, it's over 1200 acres; is that right?

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A. Yeah, that's correct, which is about 2 square miles if you put it in two blocks.
Q. So what does Appendix F have to say about the geo mean yield?
A. Appendix F provides guidance on -- so you conduct all these slug tests. What do you do with them? Do you look at a mean, a geometric mean? Do you look at the high and low? And it tells you to look at a geometric mean, which is a better representation of the variability across a data set that's not what's called log-normally distributed.
A lot of environmental data is like that because you'll have some zones that will make water in other places. In this site in particular, we have places where this water-bearing zone, you can't even find it, it's clay. And so to evaluate that variability, geometric mean is a better parameter to look at.
Q. So you just talked about the fact that some of these wells purged dry, and that's what this aerial and depiction reflects; is that right?
A. That's correct. This depicts two things. And the yellow circles here are wells that actually purged dry. And so when we go out

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in the field and collect water samples, we'll go out with a series of bottles. They don't look exactly like this, but let's just use this as an example.
So we might have to fill two or three of these in the process of purging water out of these wells that are shown in yellow. They go dry, so to speak, so you put your pump down -- or you put your tubing down, you pump the water out. They don't yield enough water, and so you've got to wait until they recharge to be able to fill your sample bottles.
And so when we mean purged dry, they don't make a lot of water. And it's a really direct indication of how much water will this zone yield. This is without even slug tests. And so we have six of those.
We also have five locations on this map. Those are in -- highlighted in orange, where we specifically drilled locations looking for the water-bearing zone where we'd expect to see it based on some of the previous drilling, and we didn't find it.
And so what does that tell you? It's not at that location at that depth, which tells us

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it is variable and discontinuous. And so that's important, too, relative to supporting our slug test analysis and the classification across the property.
Q. So let's go to the next one. And we have really some technical support or technical reasons as well as common sense reasons as to why water well drillers do not tap into a shallow water-bearing zone; is that right?
A. That's correct. And these bullets kind of explain, you know, some of the technical support for look -- when water well drillers -- you know, you say I'm going to build a house and I'm going to call a water well driller, you get them to come out, how do these things -- how are these important to them?
Well, the first one is, I think, fairly obvious, and you've seen the shallow water-bearing zone's primarily silt and typically it'll have some component of clay, typically what's called poorly sorted. Water doesn't move very good through them because they're not good course sands that are uniform.
You might ask, well, what is? The Chicot Aquifer obviously is. A water well on a

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property can make 3,500 gallons a minute. That's an important water-bearing zone because of the ability for it to transmit water.

These zones are typically poor quality, susceptible to drought conditions. I think we already covered that. Low yield. Susceptible to contamination, you know, agriculture, use of pesticides, herbicides.

And again, the proximity of these zones to the ground surface doesn't give you a lot of filtering capacity. The soil and the earth above water-bearing zones is basically filter, and so septic tanks and flooding and just activities on the surface can influence very shallow water-bearing zones. So water well drillers don't like to go there if they don't have to.

These zones typically don't meet the definition of an underground source of drinking water, i.e., they can't supply water to a public supply. This zone doesn't on this property.

There's a couple practical things here at the bottom that the panel may have seen before. From a practical standpoint -- and this goes clear back to the EPA in the '90s. You know, when you really think about it, when you're trying to fill

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a glass of water in your house, if you don't have the proper flow rate or you take a shower -- you know, you don't want to stand at the sink for 5 minutes to fill up a bottle of water, and so the pumping rate becomes important relative to practicality.

And this document back in the '90s suggests -- you know, water well drillers don't get interested in zones, especially when there are a lot more productive zones like the Chicot on a property.

And then this more recent reference, 2009 -- and again, this is a practical example. Filling a 5-gallon bucket at a flow rate of, let's say, 0.55 gallons per minute, which is the Class 3 number, takes a long time to do that. And so the guidance for homes recommendations is 6 to 10 gallons per minute. And, of course, these zones can't provide those kind of yields to make it practical from a water well driller's standpoint.

And then finally, and importantly, you might say, well, how do you know all this? Well, I've talked to quite a few water well drillers over the years relative to what do they do and how

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do they evaluate where to put wells. And one of the things that I think is probably very important is the cost to install and operate a Chicot well versus some shallow well that you might have to overengineer -- you know, water well drillers like to give you the best cost. They'll come out with a standard PVC pipe, standard submersible pump might pump 18 to 15 GPM or whatever. To engineer all of that different to make use of one of these zones takes more -- of course, costs more money, takes more, I guess, expertise, which typically my conversations -- and I think we'll show one -- they don't go there. They guide you to let's go to the Chicot at 150-foot deep and I can tell you I can give you a good well.

Q. So here you have cross-section E to E prime, and so explain to the panel what this cross-section reflects and some of the areas that have significance to you.

A. Sure. If you don't mind --

JUDGE PERRAULT: Sure.

A. -- I'll stand up.

This cross-section is a little bit different than Mr. Purdom's because we actually use water well driller logs and their

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interpretation. This isn't ERM's interpretation, it's not ICON's interpretations, it's water well drillers that drilled these wells.

I'll point out to the scale here, which is on the left, some of these wells go down to, you know, over 300 feet. And what you see in green is what they have logged as clay. They typically aren't trained geologists like myself. They look for grain size and they look for the coarser sand and gravel down deep in the Chicot because they know that will make quality water.

So these are their driller's logs, and you can see what they classify the shallow upper 120 or more feet is clay. But when we do our more technical borings and we're logging continuous soil samples visually, we still show a lot of clay, but we'll pick up these little silt zones and stringers they don't really care about and then we find a zone where we think it will make some water. The water-bearing zone, which we're calling this property, we'll put our well in, you know, take a sample.

And so there's kind of a big difference here from a water well driller's perspective. And if you remember the map I showed, this is where

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they end up right down here and you can see in some cases you get some gravel down here. That 10-inch diameter well on this property, it's down here at 200 feet. It's in the Chicot. It can make a tremendous volume of water based on that 2017 test. And so that's kind of the difference in, you know, this real fine grain -- or fine resolution evaluation versus a water well driller.

One other thing I'll point out on this diagram, these blue labels, these are water levels that were measured at various times in the Chicot. And what -- so you can see, they're, you know, about 30 or 40 feet down. The water levels that we see in the shallow zone are much higher. They're much closer to the ground surface, and so what that tells you, there's a good hydraulic separation, which means this clay confining unit is really doing its job separating the shallow water-bearing zone from the Chicot.

It also tells you -- and I encourage you guys to look at these, you can see them closer in your plan, is that the water level in the H-12 well right next to the blowout pond -- and we surveyed that top elevation of pond, there's a difference there, too, which tells us the pond's

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not connected to the shallow water-bearing zone. The shallow water-bearing zone is not connected to the Chicot.

So this cross-section, I think, comes at it from a water well driller's perspective, but we bring in the site-specific information to show the relationship between, you know, both water-bearing zones -- well, the Chicot and the shallow water-bearing zone.

BY MR. GREGOIRE:

Q. So when you mention shallow water-bearing zone, I know the panelists have heard this on several occasions throughout this hearing, but is there a dispute about the depth at which the shallow water exists beneath the Henning site?

A. I don't believe so. I mean, I think both parties, if you looked at the plaintiffs' most feasible plan, I think we arrived about the same depth interval of where the water is -- where this shallow water-bearing zone has been defined.

Q. And at what depth is the shallow water-bearing zone at this property?

A. It's typically between, I would say, 30 to 50 or 60. There might be a well or two that

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goes shallower. Some of the ones way on the east of the property that are kind of the background wells, I think they're screened as shallow as 20.

Q. And that's near Bayou Lacassine; is that correct?

A. Yeah. That's like about a mile to the east. But the ones in Area 2, 4, 5, and 6 are more like 30 feet down.

Q. And the blowout pond, as we've heard from others earlier, ERM measured it at a depth of 15 feet; is that right?

A. Yes. Yeah. We went out there on a boat, you know, sounded the bottom -- and we wanted to be sure we knew how deep it was so we could take samples at the bottom and at the top to make sure -- you know, we wanted to look for stratification, are we missing something. So that's why we measured it. That's why we sampled the way we did.

Q. Lastly, you testified briefly about it earlier, but at what depth or depths does the Chicot Aquifer exist beneath the Henning site?

A. Well, typically -- I think the shallowest that we saw in the area -- and this was within a mile radius -- about 120. As you can see

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on this cross-section, some of these wells are screened, you know, quite a bit deeper.

Here's a couple over here that are a little shallower. These screens are, I don't know, 160 or so. I think we have all this information in the plan.

But where the Chicot -- you know, at the very top, you get this what we call transition zone. It's kind of a little bit finer. And you can see the -- the drillers tend to get down further into the sand to make sure they're into the coarser material. Sometimes you'll see a driller say -- and they use pretty simple descriptions. They'll say fine sand or coarse sand, and they typically want to go coarser because they know it will give a better yield, typically better quality as well.

Q. So, Mr. Angle, as a hydrologist with expertise in fate and transport of constituents, among other things, have you seen any evidence of hydraulic communication between the shallow water-bearing zone and the Chicot Aquifer at this property?

A. No, I have not.

Q. So the next slide is another

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cross-section. This is B to B prime. And so if you can describe to the panel what has significance to you or relevance in this cross-section.

A. Yeah. There's two things, I think. And it's mainly -- I think Mr. Purdom showed this. The only reason I'm showing it again is to talk about some of the things I heard over the last couple days relative to -- if you don't mind, I'll jump up here again.

Dig a pond out here; right? Digging -- I think I heard a number 25 feet, so, you know, we want to dig a pond on the west side of the property. This is an east-to-west cross-section. Blowout pond there is kind of on the west. So don't forget, the pond here is about 15 feet.

So a 25-foot pond, the ground surface is about 5 feet above zero. Here's a scale here. Say you end up down here, and so you end up in this clay. Not a lot of water-bearing zone here. You can see the water-bearing zone which is encountered over here is quite a bit deeper. So a 25-foot pond, you know, doesn't really move the needle in my book relative to -- you know, if that's what you want to do, you know, have at it.

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I don't see an effect relative to that depth, primarily, you know, because the water-bearing zone's down here and, you know, when you're talking about a pond, the amount of water in a pond relative to the amount of water in this water-bearing zone, if there was any mixing at all, you wouldn't see it.

It's kind of like a water-bearing zone connected to the Mississippi River. If you test the Mississippi, are you going to see it? No. And so it's not going to materially affect whatever's in the pond, depending on what water you use to fill it, whether you use surface water or groundwater.

One other thing. I don't know if Mr. Purdom pointed this out, but when you guys review our report, you can look, we've actually placed the individual slug test results across these cross-sections. You can kind of evaluate across the property to see the variability as well as the chloride numbers and you can see, you know, where they're higher and lower. It's kind of a useful tool.

Q. While we're on this cross-section, it depicts the ponded area at the blowout location; right?

A. Correct.

Q. And so you've heard some questions this week, and I think mainly yesterday, about whether the blowout was a bottom-up or a top-down event. Do you remember that?

A. I did. I heard it.

Q. Certainly you're not an operations engineer and you're not the person to identify source or cause and origin; is that right?

A. No. That was Mr. Kennedy. And his report's attached to ours. I'd encourage you to look there. He evaluated that.

Q. And that's at Exhibit 30 of Chevron's exhibits? I believe it is.

A. Yeah, yeah. But I do know it's attached to our -- our -- whatever exhibit our report is. I think it's attached to ours.

Q. And what was Mr. Kennedy's opinion about whether it was bottom-up or top-down after his evaluation of the documents and the data about that blowout?

MR. CARMOUCHE: I'm going to object to Mr. Angle testifying as to what Mr. Kennedy said. I think it's correct that we have an

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engineer on staff. As a panel member, he's able to understand and read Mr. Kennedy's report and draw his conclusions, but listening to a witness who's not qualified, I don't think, is relevant.

JUDGE PERRAULT: Why are we doing this?

MR. GREGOIRE: An expert is entitled to rely upon other expert evidence, including hearsay, if it's reasonably relied upon by that expert. We do it every day in court.

JUDGE PERRAULT: I'm going to allow it. Please proceed.

A. Yeah. The only thing I think I'm relying on is Mr. Kennedy said it was a surface issue, the release, or what led to the blowout happened at the surface, it didn't happen in the subsurface in a piece of casing that broke or whatever. That was his opinion.

And from an environmental standpoint, when we look at the data -- and I think we've probably -- if Mr. Purdom did walk through some of it. It doesn't give you the impression it was a bottom-up source from the data.

So that's, I think -- but again, I'd encourage you to look at Mr. Kennedy's report. He

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was the petroleum engineer that evaluated it.
PANELIST OLIVIER: Before we move on, can I ask a question?
JUDGE PERRAULT: Yes, sir. Just state your name for the record.
PANELIST OLIVIER: This is Stephen Olivier. Being that we was on this slide and you were kind of answering about ponds that were potentially being dug down to 25 feet. Just from your professional experience, considering this specific site, do you feel -- would it be even physically possible to be able to dig a pond down to 25 feet at this location?
THE WITNESS: That's a great question because the deeper you go in these kind of soils, they tend to want to slough on the sides, you know, and so -- yeah, 25 feet's pretty deep. I think there's a couple references that Dr. Connelly produced relative to farm ponds, you want to build a bass pond or something like that, you know, they typically are shallower depths.
And so when you start getting to those kind of depths, you know, how is the soil

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going to behave on the side, first of all, what kind of equipment are you going to use to dig it and then the ability of the soil to maintain -- if you try to maintain those steep slopes, will it over time?
I think the -- I think our survey of the blowout pond, you start getting -- the slopes start changing, and so -- but it's a -- that was a good question because it -- I was trying to think in my mind, too, how do you go that deep and what kind of sidewalls you want to maintain.
PANELIST OLIVIER: So you think it would be maybe possible but difficult?
THE WITNESS: I think that's right. I mean, I think it would take some evaluation and probably some engineering. But we evaluated -- if someone really wanted to try to do it, from an environmental standpoint, have at it, but -- because I don't see how the data is going to preclude you from -- if you really want to do that, an engineer, I don't see how the data -- the testing data would preclude that.
PANELIST OLIVIER: So if ERM were to -- let's

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say if ERM were to go and, you know, evaluate all the 29-B exceedances, soil and groundwater, down to 25 feet and, as it's delineated, if ERM was able to let's just say -- or Chevron -- able to excavate that material, how would y'all handle that material that would be excavated from that pond area.
THE WITNESS: Right. That's a good question, too. And that's where I'd refer you to the testing data, in particular. We don't -- you know, you heard a lot about barium in the upper 2 feet. When you look at the data set, that's kind of what we have. Below there, we're just talking about salt. And so you look at the salt concentrations in the depth.
And so when you look at the -- basically the upper 10 feet, we do have some low exceedances, you know, maybe you see 5 or 6. And so you bring those to the surface with the massive volume of soil to dig a pond like this, probably not going to see it.
When you really look at it from a bulk perspective -- so those don't concern me to how do you manage that soil, because, quite

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honestly, it's salt. And when that salt comes up to the surface and you're moving that around, that quite quickly attenuates. And so from a more practical pond depth, I don't see a great issue.
Another thing to keep in mind out here is -- and this is getting maybe a little ahead of ourselves on remediation. But it's my understanding and my appreciation of the plan that you will hear later, there's only a soil remediation area total of a little over 1 acre.
And so I've read Mr. Hennings' testimony. He wants to build a big bass pond on the whole west side of the property, so one -- there's only -- so if you have some salt areas that you're talking about remediating but if you're digging a pond that massive and you only have 1 acre that you really are interested in, again, I don't see a big limitation of that.
You know, of course, when you go down even deeper, you have some higher salt concentrations, so you've got to go deep to get those, you know, higher salt

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concentrations. But from a practical standpoint, a typical pond out here, I just -- I guess I don't see the technical reasons why you couldn't do that.

You know, one other thing that always comes up in sites like this is, you know, these steel well casings that were -- some of them date back 80 years. When those wells are plugged and abandoned, I think most are probably familiar with that, they're cut off 5 feet below the ground surface, they're left in place.

And so a 25 feet pond is going to intercept some of those. And so if you say, well, we're going to build our pond in some of these formal operational areas and so you're going to take away your ability to go back into those casings and if you don't want to stick it in the bottom of your pond, you may have to cut them off again.

And so, to me, the deeper you dig in the vicinity of those, there's some considerations, too. And that's -- that's a limitation that was probably set 80 years ago when the decision was made to produce oil and

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gas and put those wellbores in place.

So sorry, it might be a little long answer, but...

PANELIST OLIVIER: That's okay. That's good. Thank you.

BY MR. GREGOIRE:

Q. Let's move to our next slide. And you have here the grain size of soil. And so what does this mean to you, Mr. Angle?

A. Yeah. And this is -- if you don't mind, this is just a -- kind of a blow-up scale. We have a ruler at the bottom, 12 inches on the bottom, and we have, you know, centimeters on the top here. There's about 2 1/2 centimeters per inch. And so we've done this for the panel, and it's kind of -- it's always good for us geologists to look at it so we can -- because in the field, you know, your eyes are only so good, you can't really discern these particles sizes, but they're important relative to decisions on putting in water wells.

And so on the far left, this is fine gravel here. You get down in the Chicot, you can get some -- some material you can actually see, and this is -- you know, if I were to put a sample

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on your table, you could see some of this size. But as you move to the right here, you get into, you know, finer sands you can typically see. Sometimes you take a hand lens in the field. But then when you get into this silt and clay range, it's pretty much impossible to discern with your eye these smaller grain sizes. So you can imagine a water well driller out in the field that typically is not a trained geologist, you know, when he sees stuff like this, he just keeps on going. But the particle sizes for us, it helps us understand the permeability of how quickly fluids might move through something. I thought it was kind of a refresher, just so everybody can see that, from a practical standpoint, grain size becomes very important for putting in water wells for domestic supply.

Q. And this is your own cross-section, of course, and it compares a monitoring well versus a water well. And so if you can, describe to the panel what you want to convey here.

A. Yeah. And we tried to make this fairly representative. It's more of a -- I guess, a demonstrative, but it's -- we tried to abide by the geology that we found underneath the property.

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And there's a couple purposes, number one, to show the proximity of the water-bearing zone to the ground surface. We just put a little house up here for, kind of, scale. Where it might have a septic tank. Where the shallow water-bearing zone is. Again, we used brown. It's a silt zone, you can see the variability. And again, this is based on site information.

And then you can see the Chicot. Obviously it's not a layer cake, so it's not a straight line. The Chicot -- top of the Chicot can vary in the area. And so this would be a typical, you know, domestic house water well. This is a typical monitoring well. You can see obviously there's a difference in depth and a difference in geology and that's important relative to -- you know, we put in monitoring wells to evaluate these shallow water-bearing zones. Water well drillers focus more on, you know, potable supplies. And so that's just the difference.

We put the pond here, the blowout pond at scale, so you can kind of see where that is relative to the water-bearing zone. This is probably a good one, too, to look at relative to,

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you know, excavating a pond, you know, at different depths.

Q. So next, we have the definition of a USDW, underground source of drinking water in Section 319 of Chapter 3 of 29-B; is that right?

A. That's correct. And that's what this is. It's just a blow-up there so everybody can see it. And basically it provides a definition for a USDW.

And so there's two key things that either supply the public water system or contains a sufficient quantity of water to supply a public system for human consumption, contains, you know, TDS less than 10,000.

And so what we have at this site, at the shallow water-bearing zone is not a USDW. The USDW that we do have at this site is the Chicot, but the shallow water-bearing zone does not meet this definition.

PANELIST OLIVIER: And just for clarity purposes -- this is Stephen Olivier again. I know it says that it on there, this is coming, you know, from 403, Chapter 4. I think y'all mentioned Chapter 3, so just for clarification because I see it on the slide

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here and I was just pointing out that it was --

THE WITNESS: You're correct.

MR. GREGOIRE: That's the exception statute 319. You're correct, Mr. Olivier.

BY MR. GREGOIRE:

Q. So next, you have the: "Why water well drillers do not tap into shallow water-bearing zones," and so you can explain what this letter from EPA provides.

A. Yeah. This is back to that summary slide where we referenced that '93 EPA document. This is just a couple excerpts from it, and these are kind of practical excerpts. This first one is instantaneous yield. And it goes back to the glass of water, you know, when you put your glass of water at your sink, you want it to fill fairly quickly. You don't want to wait a long period of time. And so that's important.

And then the second one here at the bottom -- and this is what I had referenced in that bullet. Again, where we have these aquifers that can generate a lot of water, you know, named aquifers like the Chicot, this is important that really you need quite a bit more flow than the

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RECAP number will tell you.

A RECAP 800 gallons per day, again, is only 0.55 gallons a minute, so it's only a quarter of this 2880 number here.

MR. GREGOIRE: And that document is included as Exhibit 41 of Chevron's exhibits, which we'd like to offer and file into evidence.

THE WITNESS: Correct.

JUDGE PERRAULT: And what's the title of Exhibit 41?

MR. GREGOIRE: It is an EPA letter from -- I'll give you the exact name.

It's a memorandum from James Elder, director of groundwater and drinking water at EPA to Margo Oge, O-G-E, on assistance on compliance for 40 CFR, Part 191.

JUDGE PERRAULT: Okay.

BY MR. GREGOIRE:

Q. So your next slide is why water well drillers do not tap into shallow water-bearing zones.

And explain to the panel what this handbook provides generally.

A. Yeah. Again, this a practical guidance handbook. Actually, I picked it up at the

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Groundwater Week in December. There's probably more water well drillers that comes than there are technical scientists like me, but...

But anyway, what it does is it's a book that says, okay, if you're going to put in a water well, you're going to build a house, it gives you some guidance on the kind of flow rate you might need out of a well, you know, 6 to 10 gallons per minute.

Obviously this shallow water-bearing zone doesn't make that kind of water. So this is more of a practical point of view, when you look to a zone like this, you know, is this a viable future usable zone relative to the amount of water you might want to supply to a house.

Q. And you talked about this earlier, there's record of communication. You spoke with a local water well driller about whether you could tap into a shallow water-bearing zone for a water well. And what was the communication?

A. Yeah. And this is just -- I just blew up this, and again, we attached this to our plan in one of the appendix. But basically when you ask them a question, you know, can you drill a 30-foot-deep water well for us, I was like, well,

we need core sand to install a well, you can't just go to 30 feet and put in a well.

But if you read further, they'll talk about the size of the well they want to put in, the typical size of the submersible pump, which will have a pumping range of 8 to 15 gallons a minute. And that's important because if the zone doesn't make enough water, it can easily burn out a submersible pump. Or if the zone, in drought conditions, you know, starts -- the amount of available water goes down, it can burn up the pump.

And then, you know -- and I think, some of the past conversations I had with water well drillers, that they're not confident on the quality and the -- and reliability of these shallow zones to -- they don't want to get a call in the middle of the night, hey, my well stopped working or my water doesn't taste good or whatever.

To drill a 150-foot well, when you look at the cost differential, it's not there. It's -- you've got to bring the drill rig out to the property. There's not a lot of cost differential between going 30 feet and 150 feet because a lot

of your cost is already built in.

So anyway, that's typical conversations that you would have with a water well driller if you really wanted to put a well out on the property.

Q. So next you want to discuss the background groundwater quality. And what is your opinion about that background groundwater quality at the property?

A. Well, it's definitely naturally poor and the concentrations of four constituents rise above the drinking water standard. And that's based on -- the four wells you see in yellow out to the east, far east of the property, as well as the three wells on the far west of the property.

Obviously we've done a lot of talking about the investigation that's been done to Areas 2, 4, 5, and 6, kind of in the central -- and some in 8 up there. So we looked at groundwater quality data from those locations to evaluate the overall water quality, you know, kind of in a natural state.

Q. While we're on that slide, I want to ask you, did you visit this property?

A. Yes. I've been out here three times --

or been on the property three times. The first was in 2019. That was kind of early on. And then two times in 2021. And I actually was out there when ICON was drilling the -- what they told me at the time was background wells on the far east side of the property. You could see they're quite distant from the west side.

Q. And that's the locations H-32 A through H-34, four locations; is that right?

A. Correct.

Q. And so you were out at those locations. When you visited the property, did you see any remnant of oil and gas operations while you were out there?

A. No.

Q. Is there anything in that area that would suggest to you that the data or the samples that were taken in that area were not indicative of background water quality?

A. No. Because when we look at that data, we also look at data from some of the wells to the far west. They're quite similar. So it gives us comfort that we have a good idea of what the background water quality is on the property.

Q. You didn't see any flow lines in that

area?

A. Uh-uh.

Q. Tank batteries?

A. No.

Q. Evidence of historical pits?

A. No.

Q. Okay. Let's move to the next slide.

So here you have a Piper diagram. And can you explain what this is and explain the data that is set forth in your graphic.

A. Yeah, sure. And this is a diagram you might want to spend a little bit of time with when you look at the report. But it's an attempt to take a table of numbers like you'll see in the report with all the sample results and plot the concentrations of calcium, magnesium, sodium, potassium, cations, and ions, chlorides, sulfate, and bicarbonate. And we use it to evaluate water quality across a property. It's a large property and we've got a lot of wells, 30 wells, I think, 60 samples. And so what does it tell you?

And so we also try, if we can, to find a produced water sample. That's in red. We found a 1983 produced water sample from the field, and so we plot that here. And so you can see there's

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some groupings of the data. Each dot is a sample. The four blue squares, I believe, were the four ICON wells to the east. But you can see there's -- you know, there's quite a bit of overlap here. There's one group. We think most of this group is fairly typical natural water quality.

You see a distinctly different group here? Two blue circles are from the pond. You might say, well, what is that? Well, I think that's H-3, a little shallower screened interval that's further to the east. It's a little bit different than the majority of the data.

There is at least one location -- sometimes these points lie on top of each other, but there's at least one location that clearly, in my mind, that looks like produced water. I think that's H-12. If you remember, it's right by the blowout. There's two that have the high salt concentrations, 9 and 12. You would expect them to be closer to here, so that tells us there's a produced water signature there.

But what this does is it gives us a way to look kind of graphically to further evaluate the data just -- other than comparing it to a

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numerical standard like the chloride 250. And so we want to see how the different samples group relative to background.

So that's called a Piper diagram. And I'm going to show you one more. Again, this is also in your report. This is just another way to show individual samples. Because you couldn't -- sometimes you couldn't see the dots.

The same methodology, the cations and anions. And I'll point you to ones that are pretty easy to see. Here's what a produced water signature will look like on one of these diagrams, which is called a Stiff diagram.

I'll point to you H-9 and H-12, which you just talked about. When you look at those, it's got a produced water signature. But then when we walk over about a mile or more to the east, we start looking at the background, we get a much distinctly different graphic display.

And when I look at these, obviously it's distinctly different, but when you actually look at the water quality -- and I've looked at seawater samples and other things. This shape tells me this is more of a background natural shape with a little bit of chloride because the

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bottom, when it comes out like a cone like that, the seawater will come out in a big cone. So when you look at the chloride of these, you're up over, you know, 250.

So anyway -- and you can -- you know, again, I encourage you to look at these, but there are a couple of locations that have produced water signature but, by in large, a lot of these don't -- don't look a lot different than background.

Q. Let's go to the next slide.

So this shows the results of chloride sampling in the groundwater which some of the other witnesses have testified about.

Can you just generally describe for the panel your observation about this data set?

A. Yeah. I think the thing to point out -- and Mr. Purdom went through the distribution here. But if you look on the far right, it just gives the panel an idea of the chloride range of these background wells. And the highest that I'll point out there is that H-33, with a 629. So the, you know, drinking water standard's 250, so that's two-plus times.

And then you look on the far west side,

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you see concentrations again rising over 250. And then, you know, in the central part, you do see locations that obviously go above 250, and the highest ones are right in the vicinity of the blowout pond.

But we use this, again, as another way to look at, you know, background water quality.

Q. One question about background water quality. Your background for chlorides is 687 milligrams per liter; is that right?

A. Right. And that's presented in the hypothetical plan which I think we'll get to in a little bit. But yeah, that was a statistical calculation based on using these wells. And it's a little bit higher than 629. That has to do with the statistics, you know, to making sure that it represents -- adequately represents the universe of potential background and groundwater quality.

Q. And as we know, that number is almost three times, certainly more than two times, the secondary maximum contaminant level for chlorides in the groundwater; is that right?

A. That's correct.

Q. So let's move next to barium in the groundwater. And this, again, has been shown and

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testified to by others, but can you briefly describe to the panel what you observed here with this data?

A. Yes. And I'm going to step up for this because, I mean, we -- I was in the back and I heard a lot, lot, lot, lot about barium in soil, so I just want to go a little bit into the barium in groundwater.

I mean, the story of barium in groundwater is quite interesting. There's really no barium in groundwater to speak of except this one location. We have it highlighted in blue, and that's H-12. There's a little bit in H-9. But we used the drinking water standard here to highlight the blue. Obviously Class 3 standard is 45, but... Just so it jumps out.

But when I look at these barium concentrations in these wells -- and you know, from the background, even to on the property, they're quite low. We've done -- I've done a lot of groundwater work across the state and barium -- typically we see a relationship between barium and chloride. We don't see this. You just don't see a lot of barium in these wells. Typically we'll see higher natural barium concentrations than we

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see in the majority of the wells on this site.

And you can see how quite low these are, these barium values. So you might say, well, why is that important? Well, it tell me that whatever barium's in the upper 2 feet clearly won't make it into groundwater. And the only barium that is in the groundwater -- and I think Ms. Levert touched on it -- was that barium was probably associated with produced water.

I've seen a lot of produced water samples, and typically some of them will have a barium analysis. And produced water does have some barium in it. And when you look at that relationship, there is a relationship, so you would expect -- and if you -- I showed you on, the Stiff diagrams, you can see that produced water signature, so H-12 has that.

And so the most likely source of that barium is from the produced water. It's not from leaching of barium from the upper 2 feet. We just don't see it.

Q. So next, you have the groundwater data for sulfate in the groundwater; is that right?

A. That's correct. And this is a little bit unusual because we don't typically see sulfate

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in groundwater that rises above the drinking water standard, but we have it here. And we have it in the background. On the far right, you can see some of these concentrations will rise above 250. Over here as well (indicating), but we don't have much in the -- where we see the high chloride and barium.

So, you know, when you're looking at it, take your eyes across the map and look at all the numbers, they rise above 250. And again, this tells you this is another reason why this groundwater is not potable. It's not potable for chloride reasons. It's not potable for sulfate reasons. And we won't go into iron and manganese, but it's kind of the same issue with those. Just, it tells you it's naturally poor.

Q. And you actually performed an analysis of chloride versus sulfate to determine whether sulfate that exists in this data set is naturally occurring versus whether it has some correlation with the level of chlorides found in the groundwater; is that right?

A. That's correct. And what this shows you is that if you had a correlation -- if you have a line coming up like this, 45 with yellow dots

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along it, it's basically got an inverse correlation.

If I were to plot barium from a -- you know, a typical site -- and chloride, a lot of times you'll see a relationship. But in this case, the sulfite -- or sulfate just doesn't show any relationship between the chloride and the sulfate concentrations.

Q. So for that reason, among others, it's your conclusion that this shallow groundwater has poor natural quality; is that right?

A. That's correct. On quite a few different reasons.

Q. Next, you've already talked about the Chicot water well or water supply beneath this property, the public water supply. And there's also one other available water source at the Henning site; is that right?

A. Correct. And I think I said earlier that I'd show you where that water well is. You see my pointer? It's right there. It's that blue dot. Should have probably made it in yellow. But it's right off the highway. That's that 10-inch diameter well.

So that's a large diameter Chicot water

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well that provides 3500 GPM to the property. That's important.

Secondly, we've got a public supply. That's the blue line. And I think Mr. Purdom showed that, you know, here's the canal system that comes on the property to irrigate the -- you know, the rice field.

And so typically we -- you know, a lot of sites I work on, you don't have this kind of availability of water on a property. So that's important relative to, you know, potential future uses. Okay. Do we have water? Yeah, we've got three sources: We've got a surface water source; we've got a public supply source, which is potable and tested; and we've got a Chicot source that can provide potable and high-quality and high-yield water.

Q. So let's talk about Chevron's most feasible plan. And you first -- and you can take control of the pointer.

But explain to the panel the elements of Chevron's most feasible plan from a cost standpoint.

A. Certainly. And so our most feasible plan is in Section 10 of the report, and that

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section is entitled, "Remediation plan," and for good reason.

The first thing we're going to do is we're going to propose -- although the NORM material is not part of the Chevron area, we've provided a cost to do that remediation, so we've got NORM remediation in the plan. It's about 14,000. I think Dr. Frazier talked about the work we've got to go through to remove a couple pieces of NORM pipe. But anyway, so we have that in here.

Q. And that's off of the outside of the Chevron operational area, is it not?

A. Correct. Correct.

Q. Okay.

A. We have contingent SPLP chloride sampling. I think Ms. Levert pointed out a couple of spots there that we -- we do have SPLP chloride. We didn't -- there's a couple spots, you know -- the panel may feel we need to go back and get some more. We've provided a cost to do that.

Q. Let's stop you right there while we're talking about SPLP chloride sampling.

What's your experience with the use of

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SPLP chloride analysis and sampling to determine the extent of cross-media transfer from soil to groundwater?

A. Typically that's what -- on other sites, when we have salt concentrations that rise above 29-B, you know, above the root zone or the agronomic zone, the agency has asked us to look at, you know, the DEQ SPLP procedure, and so that's what we have.

But in this site, we looked at a lot more, not just the SPLP testing. We looked at the geology, we looked at the geotechnical testing, we looked at the electrical conductivity probe logs. And so it's just a piece of our technical story. But it's not -- we don't -- it's not a sole stand-alone piece because I think the supporting information out here is important for you guys to see beyond the SPLP testing.

Q. Thank you.

Next?

A. Barium. I'm not going to talk a whole lot of barium. You've already heard it. We've got 21 step-out locations. And these are pretty much solely for delineation purposes to be responsive to, you know, requests that we have

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gotten in the past on trying to attempt to get full delineation.

And so these are barium soil samples literally in the upper 2 feet. These are most likely to be collected with a hand auger, not the geoprobe piece of equipment that you guys saw. Relatively easy to do. And so that's -- that's that component.

Q. So real quick on the barium soil delineation. The purpose of the delineation is to really answer the question of the Office of Conservation about achieving full vertical and horizontal delineation of all constituents of concern; right?

A. Yes, sir.

Q. And here the purpose is to achieve full horizontal delineation of barium -- is that right? -- in the soil?

A. That's correct. As you remember and I think Ms. Levert testified, there's only three detections above the screening standard below 2 feet, and so it's primarily -- well, not primarily. It is solely to do this horizontal delineation.

Groundwater delineation. I think

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Ms. Levert talked a little bit about this, but to give you a little bit better understanding of summarizing all of the groundwater that -- in this particular area, if you remember, the highest concentrations are 9 and 12. We have monitoring wells around there, you know, to help us do the delineation. And we put these first three in to say, okay, can we delineate with these three?

We're good on these two. This well here MW 4, we got a concentration around a little over 1,000, I think. And so this is -- the distance here, I think on the scale -- look on your map -- is probably less than 500, so we proposed -- and I think, in our past experience working with the panel, they'll probably want us to look out a little farther, and so we've proposed a monitoring well up here, which is this MW 12 proposed location. The cost of doing that's about 18,000. This is a wetland area up here, so we'll have to go down the permit route to get that taken care of.

So that will give us a network kind of surrounding this area including, you know, the presence of H-9 and H-12.

And at that point, we'll have a

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monitoring network set up around the highest concentrations measured on the property. And so we're then proposing to monitor those following resampling of H-9 and 12, and we're going to monitor those for benzene, obviously, because we had benzene in 9 and 12, so it's important to us.

We're going to go back in 9 and 12 to -- you know, typically one sample doesn't tell you the whole story on monitoring wells. You want to look over time. And so we're going to resample those. And then we'll do up to three years of quarterly monitoring anywhere from four to six wells.

And we're going to be looking for benzene. We're going to be looking for chloride, chloride being the most soluble and mobile of oil field constituents. I think we're looking for barium, TDS. I mean, that's what we said, there's not much barium in groundwater, but we're going to look for it.

So after that three years of monitoring, that should give us the data to basically come to you and say, you know, we're comfortable where we are on groundwater, we've got stable conditions, we're seeing -- we're going to look at that

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benzene concentration to see if we see attenuation.

And if we get the data and we look at the benzene data over time and it's not moving much, then the panel might decide we might need to do something different to supplement to, you know, help kind of speed up the attenuation.

But our experience on, for example, East White Lake is we had benzene concentrations that were above the drinking water standard and over time what we have seen out there is they have all gone to nondetect with subsequent monitoring over a few years of time, and so that's what we anticipate here, but we'll play that out and see what the data tells us.

PANELIST OLIVIER: And if I may --

JUDGE PERRAULT: Yes, sir.

PANELIST OLIVIER: This is Stephen Olivier.

Now that we're talking about costs, do y'all have a cost -- as we talked about earlier, if we were to -- if Chevron was to remove all soil 29-B exceedances, let's just say down to 25 feet, if someone were to dig a pond -- I know we talked about this already -- do y'all have a cost that would be

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associated with removing that material and actually, you know, disposing of it?

THE WITNESS: We do. We're going to get to that.

PANELIST OLIVIER: Okay.

THE WITNESS: That's a good question. We've got a whole section on that.

PANELIST OLIVIER: Coming up? Okay.

THE WITNESS: Yeah. And we -- we have an appendix. And I'll refer you to, I believe it's Appendix T, which is what's called our hypothetical plan.

It was our attempt to put together a plan to address 29-B salt exceedances at depth and also remediate groundwater to a background number. We used 687 based on our statistical calculation. All of that is provided in that appendix.

PANELIST OLIVIER: And also, too, I know, being that y'all were just also talking about SPLP and he was just asking you about the lithology and so forth.

And so based on your experience and all things considered, all data you have for this site, was there anything that would make you

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believe -- or did you see anything where the SPLP would not be representative for this site based on all the data and everything that y'all collected?
THE WITNESS: Yeah. Nothing jumped out at me. You know, the way I looked at it is -- is -- beyond SPLP, I look at the -- we know we have -- some locations we have chloride in the shallow groundwater zone; right? But when you look at the geology as you go deeper, the geology and geotechnical testing and grain size gives me probably the most comfort relative to that testing, but we looked at it. It's just one of the lines of evidence to tell me.

You know, I think the experience that I've seen on sites across the state where you have these thick pipe clays that are low permeability, that salt just tends to get locked up into the clays and doesn't really want to come out and, if it does come out, it's at such a -- it's like a drip off the bottom of a sponge and if it gets into a real aquifer, it's kind of hard to measure or see, so it's kind of a -- that's a long answer to

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your question, but it's a multi-lines of evidence that's just not -- you know, it's not a magic number.

You know, SPLP's result looks good for chloride, we're all feeling good, I think there's more to it. And we like to use a broader evaluation, I guess. But I know the SPLP is kind of looked at at these sites below the root zone as a -- you know, one of the things to look for movement of chloride from groundwater -- or soil to groundwater.
PANELIST OLIVIER: So based on what you said, with everything that you looked at as a whole, did it appear to you that SPLP was -- that the results you received was representative for this area?
THE WITNESS: Yeah. I would say, yes. I'd probably want to go back and look at those because I know we've -- Ms. Levert said at two locations where I think the EC was the highest, we didn't have SPLP. So we have proposed to include them. Once those are collected, it may be worth another look to see how all that plays out, you know, the highest EC relative to what's the SPLP number

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at that location.
PANELIST OLIVIER: Thank you.
BY MR. GREGOIRE:
Q. Before we -- well, go ahead and go to the next slide. Sorry.

So what does this tell you about monitored natural attenuation and monitoring the groundwater for constituents of concern?
A. Yeah. We feel like our groundwater monitoring program is -- in particular for benzene is a -- basically a natural attenuation remedy. And what does that mean? It's a -- it's a remedial technique that is obviously identified in RECAP here. We just blew up the box here, 2.1.6. It's recognized by EPA -- or by DEQ.

But I wanted to give the panel some knowledge about how groundwater remedies across the United States are applied relative to the different types of remedies.

And I think this is somewhat telling. And again, there's probably a little explanation here that needs to be made, is that Superfund remedies for groundwater are typically constituents like chlorinated solvents, dry cleaners.

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You know, chemicals that are -- chemicals that in the EPA's mind have some real, real risk, so it's a whole kind of different class. You set that aside over here, and then you have oil and gas constituents which were regulated differently back in the '80s because they were considered to be high-volume, low-toxicity.

But nonetheless, we're looking at this for kind of what is the latest statement from EPA? Going back to the '80s, the first -- first remedies in EPA Superfund sites came out in the early '80s. And early on, you know, pump and treat was attempted to bring groundwater back -- or restore it back to natural conditions. It just didn't really work.

And so over time, pump and treat remedies are still instituted. They're used more for containment. But I want to point you to the graph in particular on monitored natural attenuation, which is the purple boxes. And see, way back in the early days, you know, that was before monitored natural attenuation was, quite honestly, a term.

But as you go over time, you see the purple boxes start to go up, you know, they

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fluctuate and here we are -- and this report just came out about a month ago. I have the older version, but this one just came out.

So we're up to about 40 percent of the decision documents. These are these what are called records of decision. The EPA comes out on these really complex sites and so obviously you can tell it's an important component on some of these sites.

What this graph also shows is in-situ treatment. So we're up here on in-situ treatment on about 50 percent. So what does that mean? You know, that means you're going to maybe inject something in the subsurface to try to degrade benzene or something. It's not -- it's not you pump it out of the ground or you dig down to 50 feet and haul it off. These are more, I guess you would call, sustainable remedies. As we go over time, various EPA and state agencies are looking at better ways to do things like, you know, we as scientists tend to do.

And so what it tells you is that what we're proposing here -- MNA for benzene is pretty common, quite honestly. And we've seen through experience as well as -- you know, I'm pretty

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familiar with the benzene degradation literature, and what it tells you is that these benzene plumes from, you know, really hundreds of underground storage tank sites, corner gasoline stations, that these benzene plumes don't go very far. You know, couple 100 feet, maybe. They're pretty limited and -- because of this phenomenon called natural attenuation.

Q. Before we move off of that, Mr. Angle --

MR. GREGOIRE: This is the 17th Edition of the Superfund Remedy Report. We included the 16th Edition with Chevron's exhibit list. 17th Edition is actually hot off the press, it was published last month, January of '23. Mr. Carmouche has a copy I provided him with. We'd like to replace 83 with the current edition which I've marked as Exhibit 153.1, which is a placeholder at the end of our exhibit list.

JUDGE PERRAULT: All right. Exhibit 153.1. Do you want to replace 83?

MR. GREGOIRE: Well, we can either make it an extra exhibit or we can replace it, either --

JUDGE PERRAULT: Why don't we make it an extra exhibit.

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MR. GREGOIRE: So it would be 153.1.

BY MR. GREGOIRE:

Q. So, Mr. Angle, let's talk about the proposed soil sample locations in Area 2, particularly the delineation locations that you summarized earlier.

A. Yes. And in blue here are the proposed barium delineation samples. Again, these are zero to 3 feet for the horizontal delineation on the west side of Area 2. And I think we can probably go through each one of these fairly quickly.

The samples have been collected already. And again, these are delineation purposes. These figures are all in your report, so you don't have to keep it in mind.

Same way with Area 4, you'll see the blue marker or blue labels, that's barium delineation. The purple here is SPLP chloride. Those are the locations Ms. Levert talked about where we had the higher EC, so I want to go back to those.

Area 5, same thing. We've got, I guess, one barium up there to the northeast and then another SPLP chloride location there at H-18.

And then finally, Area 6 -- I think

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we've --

Q. Stop after 6 -- or at 6, if you don't mind.

A. Okay. Yeah. Again, this is 6. This is barium delineation here from a horizontal standpoint.

MR. GREGOIRE: So, Your Honor, Mr. Carmouche has asked that we approach the bench for an issue before we move forward.

JUDGE PERRAULT: I'm going to go off the record.

(REPORTER'S NOTE: AT THIS TIME BENCH CONFERENCE WAS HELD BY AND BETWEEN THE COURT AND ALL COUNSEL.)

JUDGE PERRAULT: We'll take a 10-minute break, and y'all can go to your room.

(Recess taken at 11:08 a.m. Back on record at 11:28 a.m.)

JUDGE PERRAULT: All right. We're back on the record. Counsels for both parties, there was a disagreement over some -- an exhibit and testimony, and we've worked that out, and I'll let them explain their sides.

Who wants to go first?

MR. CARMOUCHE: I'll go first, Your Honor. This is John Carmouche on behalf of Henning

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Management. There was a slide that has a case that Mr. Henning filed against Chevron early 2000s. It was settled in 2018 and there's a confidentiality settlement agreement and there are details in that settlement that I think would have to be brought to the panel and would breach the confidentiality agreement.

I think the information in the letter and the purpose that Chevron is trying to offer the letter can be shown to the panel and just as effective without mentioning Mr. Henning and/or identifying the lawsuit and/or identifying that it's his specific property.

JUDGE PERRAULT: And Counsel for Chevron?

MR. GREGOIRE: Chevron's position is that the letter is a matter of public record, so, therefore, it's not subject to any confidentiality agreement or settlement agreement between Chevron and Mr. Henning for this particular piece of property but it exists as a public record and can be found, obviously, in LDNR's records.

In addition, it's very important for

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this panel to know the exact location of the property in case it wants to review that information at a later time.

Lastly, the document addresses the very same issues in the soil that we have in this case and it doesn't necessarily require the agreement of the landowner to reach the result that LDNR reached. LDNR is entitled to and has applied RECAP in every Act 312 proceeding in its evaluation of soil and groundwater.

And so the result that would be reached ultimately at this property for barium, we believe is the same that would exist at that other property, so there is nothing that would invoke the settlement agreement between Chevron and Henning.

So respectfully, we feel that the document is admissible even with Mr. Hennings' name on it.

JUDGE PERRAULT: All right. We're doing this outside of the presence of the panel. The document's been marked Exhibit 153.2. It's a State of Louisiana no further action letter.

I'm going to allow it in, but we're to

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redact Mr. Hennings' name in case Mr. Henning believes it will have some prejudicial effect. So we're going to redact his name, we're going to let him talk about the property that's similarly situated that has a similar problem with similar remediation goals and we'll let it in as that without any notice that it's Mr. Hennings' property.

It is a public letter -- a public record, I agree, but just for the purposes of this hearing, it may have some prejudicial effect.

MR. GREGOIRE: And Chevron respectfully disagrees with your ruling, Judge, and for that reason, we reserve our rights on the admissibility of that document.

JUDGE PERRAULT: So noted.

Does that clear up that issue for now?

MR. CARMOUCHE: Yes, Your Honor.

JUDGE PERRAULT: Okay. We'll go off the record until the panel returns.

(Recess taken at 11:31 a.m. Back on record at 11:36 a.m.)

JUDGE PERRAULT: We're back on the record. It's now 11:36.

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Mr. Gregoire, please proceed with your direct.

BY MR. GREGOIRE:

Q. So, Mr. Angle, where we last left off were the proposed soil sample locations at Area Number 6.

A. Yes. These are just -- again, the blue labels here are barium delineation samples and/or circles with resampling. Again, it's all for delineation purposes.

Q. And then you also have the proposed locations at Area 8 for the soil; is that right?

A. That's correct. Again, barium delineation, either resample or the majority of them, as you can see, we're trying to step away to get full delineation.

When you do this delineation, typically you start in the source area, so we fully anticipate that those concentrations were going to get on the fringe, typically lower than you might get in the source area, so that's the purpose.

Q. So here we have a "no further action" that was issued by LDNR's Office of Conservation for a property -- nearby property in Jefferson Davis Parish.

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Can you talk a little bit about that matter?

A. Yeah. I think the -- the only reason to bring this up is it was a similar issue where we had barium in shallow soils, zero to 2 feet. True total barium was analyzed to speciate -- I'm sorry. Barium was speciated, as Dr. Connelly and Ms. Levert talked a lot about. I'm not going to get into any of that. But the same methodology was followed. It was, again, a surface soil issue and "No Further Action" was issued by LDNR.

Q. And LDNR did not agree with the form of barium as presented through the speciation as being barium -- sulfate, barite, that is?

A. Correct. It was barium sulfate, as present in barite, the mineral.

Q. Let's go to the next slide.

So Chapter 6 of 29-B requires a 29-B plan along with a plan that's based upon exceptions, which is the plan that ERM has provided on behalf of Chevron; is that right?

A. Yeah, that's correct. And I think going back to -- I think Mr. Olivier's question was have we provided, you know, the cost to do this work as well as -- and I think I then went on to a

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hypothetical plan.

So in our Appendix T, we've prepared a hypothetical plan, which the goal was to meet what is called for in Chapter 6 of something called fully compliant plan with 29-B.

And so to do that, we developed a plan, and I'll get into it in a little bit. But we also need to evaluate, okay, is this feasible, reasonable, and all of those things.

And so we provide justification for why we believe this is the most feasible plan, but we do it to make sure we're compliant with Chapter 6 or what you guys might be looking for relative to a hypothetical plan.

And you might say, "Well, why isn't this hypothetical plan feasible or necessary?" We've covered some of these. Obviously from a groundwater standpoint, this is shallow naturally poor groundwater zone, Class 3. Property has three sources of water. Chicot is obviously a viable aquifer underneath the property, the shallow water-bearing zone is not an underground source of drinking water.

The soils at depth below the root zone, Mr. Ritchie testified on 1 foot, but when you look

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at the soil column, it doesn't justify the remediation of soil at depth for agronomic purposes for salt.

And as you remember, there's really nothing in the soil below the upper 2 feet with the exception of, I think, three locations but salt, so...

So I won't read all these. I encourage the panel to look at this appendix. There's a narrative that goes with this -- with these bullets on why we don't believe this is the most feasible or reasonable alternative.

Q. And before we move from that, that slide, Mr. Angle, the Office of Conservation has not included as a part of its -- or as its most feasible plan this type of hypothetical plan in other most feasible plans that the agency has generated; is that right?

A. Yeah. That's -- that's typically the case and, you know, obviously the panel -- I'm assuming that they'll take a hard look at this just like they have in the past and evaluate, you know, the reasonableness, feasibleness of that plan.

Q. Let's going to the next slide.

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And so what does this reflect as a part of your hypothetical plan in Area 2?

A. So we look at the data and we say, okay, hypothetically, if we're going to try to attempt to address all of 29-B exceedances to a depth, I think, of 32 feet in this hypothetical plan, what would that entail and what would it cost? And not only from a soil remediation standpoint but a groundwater standpoint.

So we're looking at soil at all depths to 29-B and then we're looking a -- potentially remediating -- or hypothetically, let's say, remediating groundwater to a background number of 687 or so. That's what's in the hypothetical.

So this is the first area. That's the area shown in this blue -- or purple dash, which gives a breakdown of where you would potentially remediate overburdened soil. I'm not going to get all the technical details. But it just -- we'll walk through each area. Again, it's a relatively small location, but in some of these areas, it does go down in depth.

Q. So before we move to this, or at least what you're going to testify about in this slide, I want to -- I want to ask you -- and this is in

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connection with the entire soil data set. So is it your conclusion -- and you've already said it in your summary -- that based upon your technical and scientific expertise and your applications of the applicable regulations to this soil data set that the property -- this particular piece of property is suitable, the soil is, for its reasonably intended use?

A. Yes. And that's supported by not just me looking at the data, but you've heard, you know, our whole technical team in their area of disciplines kind of all come together and tells me that the property is suitable for its intended use, including future uses, as the past 80 years of history has demonstrated the past uses.

Q. So but if -- and you're aware of the judge's ruling in this case, you've seen some of the --

A. Okay. I am --

Q. You've reviewed the ruling; right?

A. I have.

Q. And you've seen some of the quotes from that ruling throughout this case. So if you are required to depart from your scientific and technical expertise, along with this panel, and

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only for the sake of complying with the judge's ruling, are there locations of soil at Area 2 that the panel might consider as a part of your hypothetical plan for remediation in the soil?

A. Yeah. If you don't mind, I'll get up and show you the location. And in our plan, in Chapter 10, the remediation plan, we point out that there are three locations where we originally had an exceedance of a salt parameter. And this one was highlighted SAR. It's slightly above the standard of 12. I think Mr. Ritchie testified SAR and ESP don't typically ever limit the growth.

But nonetheless, we said, okay, we'll go back and take zero to 1, 1 to 2, to really evaluate that upper 3-foot interval. And so when you look at the zero to 1, you don't see any exceedances, so Mr. Ritchie testified that the root zone is the upper foot, so we don't see a need to do anything. But as you go down, you see a couple slight exceedances that are either ESP or SAR.

So, you know, from a technical standpoint in all of our information, we feel really confident on what we have proposed; however, we're trying to work this tension

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relative to what the judge has ruled.

And when you look at these, you know, one can say, okay, if we had to go to 3 feet at this location, what would we do? Well, we would simply blend in some amendments because SAR and ESP are easily treatable, as you've probably heard in the past. The EC here is actually quite low, so there's no issue there.

So it's a treatment remedy if we were so -- it was determined by the panel that if we had to go to, let's say, a depth of 3 feet, then it's a soil amendment blending-type remedy. It's no haul-off, you know, off-site disposal. And that would be at this particular location in Area 2.

Q. And part of that analysis is include -- or at least that's included in these areas -- these discrete areas we're talking about are included as a part of your hypothetical plan; is that right?

A. Yes. And I think that's -- you know, that's an important point and that's why, you know, I want you to take a look at that because, you know, we provide some backup cost information on how do we develop costs to do this work. And

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we have costs in our hypothetical plan to not only to do excavation and off-site disposal but we have costs to do amendment work, and so those costs are available.

I think, as I've reviewed the plaintiff's MFP, they've got costs in there too and these costs are similar to what was presented in the Hero Lands MFP where we were looking at amending some areas, so...

Q. So let's move to the next slide. And this is your hypothetical soil area in Area 4; is that right?

A. That's correct. And again, the areas in the purple boxes show the potential remediation areas. And, you know, I'll point out, the H-16 area that -- which is right here, we actually have a cost to go down to 32 feet.

Now, that's some digging, 32 feet, and so then you start worrying about shoring up the sides of the excavation and everything. So we've evaluated and costed out this hypothetical scenario of digging down for solely salt purposes below the root zone, and so -- it's -- and those boxes are quite -- you know, they're relatively small relative to the entire area. You can see

where the sampling occurred.
Q. So again, we have, in Area 4, if you and the panel have to depart from your scientific and technical expertise to recommend some form of remediation to comply with the judge's ruling, then what would you propose as a part of your hypothetical plan?
A. You know, I think, you know, it's the same story for Area 4. If we were compelled to -- you know, they said, Dave, you need to come up with -- you know, we're not satisfied with what you've got. And so, again, in our remediation plan, this is another one of the locations. We have ESP and SAR in the upper 1 foot. We went back. Couldn't confirm in the upper 1 foot. But when we -- when we did the more depth-specific sampling, we see a couple minor ESP and SAR exceedances. Okay. What would you do? Same thing, you know, amend the soil in place, some kind of amendment, put it back in, this wouldn't be any off-site disposal. And that's H-21.
Q. So next, we have your hypothetical soil remediation area in Area 5; is that right?
A. That's correct. And again, you know, same layout here, the purple boxes define the

areas that we would -- or hypothetically excavate, you know, in one case down to 20 feet, you know, solely for salt, so we provided a cost for that.
Q. And again, if you were required to depart from your scientific and technical expertise as well as this panel to recommend some form of remediation, what would you say in order to comply with the judge's ruling?
A. So we would look at 18 R here, 18 R, again, zero to 4, we had a slight exceedance of both ESP, SAR. We went back and resampled. We don't have any exceedances in the upper foot, but we have some slight exceedances down to 3 feet, same approach, you know, a blending and amendment-type remedy.
Q. So based on your full cost estimates for your hypothetical plan, approximately how much of those costs would you attribute to the remedial measures, the blending that you've just outlined in the three areas that you've just testified about?
A. Yeah. I think -- I think, if we were compelled to have to address those three locations down to a depth of 3 feet, we would probably be looking at a range between 150- and $250,000. You

might ask, well, why the bigger range? Well, at least one of those locations, it's a wetland area and so we'd have to get the permit. And then just getting the equipment out there, this site can be pretty wet. It depends on the time of year that we might -- if we had to do it, could require board roads, and those are expensive and so that's kind of the range.
And those costs -- you know, we have some costs in our hypothetical that you could take a look at relative to that. And then I know in the ICON plan, they've got soil amending costs. In the Hero Lands, I think the MFP has kind of a good cost breakdown.
But that's kind of the range that we feel -- and again, the reason why it's not a very large cost, so to speak, because we're not hauling soil off the property. We're just amending it because we don't have elevated EC in those additional samples down to 3 feet. It's just SAR and ESP.
Q. We'll move to the next slide. And this is your hypothetical groundwater plan. Can you briefly explain this to the panel?
A. Yes. And this was our attempt to

define -- if we were asked to, you know, hypothetically remediate groundwater out here to a nonpotable condition or a background condition -- we calculated a chloride number of 687, which is based on some of the background data that the panel had seen. We've identified these areas that have data that exceed that, and these are obviously quite large.
In this hypothetical plan, the goal would be hypothetically to pump these areas to attempt to get them back to a lower chloride value, so it's still a nonpotable condition, as you've probably heard, on chloride, sulfate, iron, and manganese. You can pump this area all day long and you're not going to get to 250.
And, I think, based on experience -- I've looked at other sites where chloride attempts have been -- or attempts to pump and treat chloride-containing groundwater over time. I don't believe this is feasible, but we costed it out like it potentially could be, and that cost is in that Appendix T.
Q. So you talked about this earlier, why it's not feasible or reasonable to remediate groundwater, and you can go through each of the

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points, if you might.
A. Yeah. I think the first and most important, you know, a pumping restoration remedy doesn't yield potable water at the end of the day.
And I think our background water quality tell us that, so you ask yourself, you know, what can you accomplish, assuming -- in theory, this is all in theory that you could actually do it.
Previous attempts have not been successful, and I've looked at -- there are not a lot of those. And you might say why is that? It's just not a lot of pumping and treating for just chloride. I mean, you might -- you know, if I ever tell you chlorinated solvents or some other things in these Superfund sites, they're not chloride sites, they're different chemicals.
So but what we were able to find in the state here, there are four examples -- and I'll just turn them all on here. These are four examples where I've looked at the records and, in some cases, these have been pumped for ten years.
These are shallow water-bearing zones. And, you know, the chloride concentration, let's say, will start out at 10,000 and maybe you end up at 9- or 8,000 after ten years of pumping. It's

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quite obvious that you could pump those things for probably infinity and you wouldn't get to a low number.
And there's reasons for that, and you probably -- these fine grain units and fine grain soils and the ability to basically extract things out make it difficult.
And then, you know, I guess finally here, massive pump and treat remedies that have been proposed in the past. The first one, probably the one I'm familiar with since I sat through the hearing was the Poppadoc plan. You know, I think it was upwards of a $100 million pump and treat plan, and it was basically determined to be, you know, unfeasible or unreasonable. And that's where the word -- going back to the definition, the reasonableness and feasibleness of a plan.
Q. So next, if you can recap your summary of -- summary of your opinions in this case, Mr. Angle?
A. Yes. First one, you know, again, this is primarily relying on Ms. Levert on the RECAP side. I heard her testify that the site is protective of human health and the environment for

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residential use. And that's important because, you know, there's all different potential future uses of the property.
Same way from the 29-B perspective. I don't believe soil remediation is required based on the multidisciplinary review. And again, keep in mind, that's not just David Angle, that's our whole other panel of experts coming to that conclusion.
We have presented kind of this amending remedy in three locations, if somehow there's a compelling to do that. But based on Mr. Ritchie's root zone study and all of our information that we know, we feel like we have a viable remediation plan, so... But we wanted the panel to hear that, hear our thinking on that.
Number 3, groundwater's naturally poor and poor quality and nonpotable. I think we went through that extensively. And the property does have access to public water supply, which is important to us in our evaluation.
I believe that groundwater's Class 3, and Ms. Levert did a RECAP evaluation relative to it being protective of human health and the environment as well as the nearby surface water

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bodies. She did all that analysis.
And then finally, you know, groundwater monitoring, or monitoring natural attenuation for benzene in one area, and we want to evaluate the groundwater over time to look at concentration changes and give the panel what they typically have looked for in the past on MFPs.
MR. GREGOIRE: Thank you, Mr. Angle. That's all the question that I have for you right now.
JUDGE PERRAULT: All right. You had offered Exhibits 146, which is Mr. Angle's résumé; Exhibit 30, the blowout report; Exhibit 41, the EPA letter from Mr. Elder on groundwater; Exhibit 153.1, the Superfund remedy report; and Exhibit 153.2, the "no further action" letter.
MR. GREGOIRE: We have a couple of others, if I might move for those. Chevron Exhibit 44, which is RECAP Appendix F which Mr. Angle addressed in one of his slides.
JUDGE PERRAULT: Okay.
MR. GREGOIRE: And the most feasible plans and other matters that Mr. Angle addressed in his testimony, they're set forth in

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Exhibits 32 to 39 and also 47.
JUDGE PERRAULT: 32 to 39 and 47.
MR. GREGOIRE: Yes.
And that's it, Judge.
JUDGE PERRAULT: All right. Any objection to 146?
MR. CARMOUCHE: No, Your Honor.
JUDGE PERRAULT: No objection, so ordered. It's admitted.
Any objection to Exhibit 30?
MR. CARMOUCHE: No, Your Honor.
JUDGE PERRAULT: No objection, so ordered. It's admitted.
Any objection to Exhibit 41?
MR. CARMOUCHE: No, Your Honor.
JUDGE PERRAULT: No objection, so ordered. It's admitted.
Any objection to Exhibit 153.1?
MR. CARMOUCHE: No, Your Honor.
JUDGE PERRAULT: No objection, so ordered. It's admitted.
Any objection to Exhibit 153.2?
MR. CARMOUCHE: No, Your Honor.
JUDGE PERRAULT: No objection, it's ordered. It's admitted.

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Any objection to Exhibit 44?
MR. CARMOUCHE: No, Your Honor.
JUDGE PERRAULT: No objection, so ordered. It's admitted.
All right. Before we go to your cross, do you want to take a break? It's 12 noon straight up.
MR. CARMOUCHE: Yeah, we can take a break.
JUDGE PERRAULT: Any objection to that from the panel? All right. We're going off the record for lunch. Be back at 1:00 o'clock, please.
(Lunch recess taken at 11:50 a.m. Back on record at 1:00 p.m.)
JUDGE PERRAULT: We're back on the record. We just finished lunch. Today's date is February 8, 2023. It's now 1:00 o'clock.
I'm Charles Perrault, administrative law judge, and we are starting the cross-examination of Mr. Angle.
Please proceed.
CROSS-EXAMINATION
BY MR. CARMOUCHE:
Q. Good afternoon.
A. Good afternoon.

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Q. I want to kind of do the same thing I did with Ms. Levert, kind of start off with your slides and then dive a little deeper. And I want to start off with one from the back.
We had a slide that said: "Why not feasible and reasonable to remediate groundwater."
How many groundwater remediations have you designed, implemented, and saw to the end?
A. To the end?
Q. Till it was complete.
A. Yeah. Active remediations, one in particular in Texas. It was a chlorinated solvent site. Another site in North Louisiana, a nitroparaffin site, involved in design and operation.
The end of it, some of these, and one in particular in Texas went for 30 years. It was ultimately turned off. It was more of a containment system. It wasn't achieving the goal.
The one in North Louisiana was a horizontal recovery system. I had a publication on it, Mike Pisani and I, back, you know, in the day. It was to recover shallow groundwater. Again, not chloride.
We --

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JUDGE PERRAULT: Please speak louder.
A. Another one, we had a free product recovery system up in North Louisiana focused on free product recovery.
All of these went on for long periods of time. I was involved in that case in Texas, the latter portion. And the one in North Louisiana, early on. And -- well, the two in North Louisiana, early on. And then other ones more monitored natural attenuation remedies like, you know, I talked about earlier.
BY MR. CARMOUCHE:
Q. So we're not going to talk about "we" sometimes today. Okay?
So you've designed and implemented one; correct? To the end.
A. You've got to understand that some of -- the one in Texas went for 30 years. It started in the '80s. And I came in and probably worked on it the better part of 10 years to get it to, you know, the next point. We ultimately got a no further -- no more groundwater pumping in that case, so I'm aware and was familiar with when that one ended because I was still working for the client.

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The one in North Louisiana, designed it, the company actually operated it, and I wasn't --
Q. So --
A. I don't know the end of that one.
Q. So none?
A. No. You know, you're not understanding, so --
Q. At best, two?
A. So the one in Texas, the one in North Louisiana, and then the nitroparaffins, which, again, none of these are chloride. The nitroparaffin site was where we designed the system. I don't know the conclusion of that one.
I do know, on the one in North Louisiana, it was a free product recovery. That ran for some time after. That was actually a Class 1 aquifer. The main objective, though, was just to remove the free product recovery. It wasn't to restore the groundwater.
Q. But you made a good point. You have not designed, implemented, or saw through not one for chlorides?
A. That's what I said earlier, because no one does chlorides. The chloride remediations -- I have not done personally a chloride remediation

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because the majority of these sites that I've been involved with since, you know, probably almost 20 years ago now, we're typically dealing with the same shallow water-bearing zone like we have at this site, and so I have never recommended one of those chloride remediations in these shallow water-bearing zones. That's a true statement.
Q. Thank you.
A. But the ones that -- and I did my homework. I actually looked in the state database, EDMS, I'm quite familiar with it, and the ones I could find -- and I am familiar with it because on two of them I worked at nearby properties. I'm well-aware where it's been attempted. I didn't attempt to do it, but I know the attempts did not achieve the goal.
Q. You're not telling this panel that there have not been remediations of chlorides in aquifers, "in aquifers" to background?
A. I'm not aware of any that were successful to background.
Q. Thank you.
A. And when you use the word "aquifer," you know, that says a broad definition. Whether it was a shallow water-bearing zone or a deep

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aquifer, there's a difference. Or a USDW.
Q. You talked about Act 312 public hearings, and you went through eight of them.
Tensas Poppadoc -- so let me back up.
So Chapter 6 has evolved over the years; correct?
A. Yeah. That's my understanding. I mean, I'm not a lawyer, but I know there's been changes since back in the day.
Q. Let me clear this up. You're not a lawyer. You are required as an expert to apply Chapter 6 to your feasible plan; correct?
A. That's our goal from a technical standpoint, you know, a technical --
Q. So you're not telling this panel you're not familiar with Chapter 6; right?
A. No, I'm not -- I'm not telling you that at all. What I'm telling you is I'm familiar -- I'm not familiar with the legal interpretation of Chapter 6, but what I am familiar is what Chapter 6 requires of me as a technical expert to try to prepare a most feasible plan. And I've done it, you know, many times now.
Q. I understand. We'll try to get through this.

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Tensas Poppadoc, at the time, there was no -- the defendants, like Chevron, were not allowed to file a limited admission like we're -- we have today; correct?
A. As I remember, that's correct, there wasn't a limited admission.
Q. Vermilion Parish School Board?
A. I do not believe so.
Q. My point being is, to cherry pick cases and to say this happened there and this happened here, it's fine, but wouldn't it be fair to this panel to just tell them to go to their own records and look to see what happened and why it happened? Wouldn't that be fair?
A. Well, that's what I kind of gave you. I gave you a road map to do that. I listed them all, and I listed the -- if you remember, across the top, I had columns like groundwater sampling, soil sampling, so -- and then I put check boxes, so it's kind of a road map, and I'm sure the panel has access to all of those just like me.
That road map was basically to focus the panel to look and see, okay, you know, the MFP that we have proposed here, those common elements are back in those. So that's, you know, kind of a

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handy chart for me because, you know, that's -- to try to remember the details in all of those, that's kind of what I used it for. And hopefully, the panel can find some utility in it as well.

Q. And some of these cases were resolved; right? After the hearing.

A. Yes. But it doesn't -- didn't resolve the regulatory process that we worked with DNR on in terms of getting those sites to closure, you know, whether it be additional investigation or remediation.

Q. But they understand the process? I mean, they understand what happens when a case resolves? I mean, that's something that they know; right?

A. Yes.

Q. You don't have to instruct them of that? They're not -- they're scientists; right?

A. Right. I'm not instructing them. I'm just saying that typically we work through those even after a case settles. The settlement of a case doesn't change the technical data and the technical data has to be addressed.

Q. I might change other factors, though -- right -- that they might want to look into?

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A. You probably need to ask them, but from a technical standpoint, we kind of look at the data.

Q. Let's go to the summary of your expert opinions Number 3: "Groundwater is of natural poor quality and nonpotable. Property has access to public water supply."

That is one of your reasons why you say the groundwater does not need to be cleaned; correct?

A. I don't think I used that many words. I think it supports our groundwater classification and it supports our remedy decision, so it's a factor, you know, you've got nonpotable water, but also we went through the aquifer tester or the slug testing process, so that's one of the factors.

Q. That's what I said, one of the factors that you considered in not remediating shallow groundwater is that it's naturally poor quality and nonpotable?

A. Yes. One of a few, but it is one of them.

Q. You would agree that within the last 12 months, ERM and yourself received a letter or a

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document from DEQ saying that that factor should not be considered when determining if a shallow groundwater should be remediated?

A. I think, as I remember, that letter had to do with classification. Groundwater quality is more -- it's not a strict classification item. Well, TDS is, so you've got to meet TDS criteria.

But actual groundwater quality, as I remember -- I'll be happy to look at it again -- it was more focused on -- groundwater quality can't be used as a sole basis to classify groundwater.

There's a procedure in RECAP that identifies do your proper aquifer testing and then look at TDS. It doesn't mention groundwater quality, and I think that's what you're referring to.

Q. So you recall the letter?

A. I do recall that --

Q. Thank you.

A. -- and I understand it, but it rises --

Q. We're going to get there.

A. Okay.

MR. CARMOUCHE: And, Your Honor, we can speed -- if I can have him answer my

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questions first. If he wants to explain his answer, then I don't mind, but we can move a lot faster if he --

MR. GREGOIRE: You just cut him off. I mean, he's entitled to explain --

MR. CARMOUCHE: I don't think I cut him off. He was finished.

MR. GREGOIRE: Your Honor, the witness was actually trying to finish his answer and Mr. Carmouche cut him off.

JUDGE PERRAULT: Okay. Just ask the question, and we'll just take his response as he gives it. If it takes a little longer, that's okay. The goal is to get a full response for the panel.

MR. CARMOUCHE: I totally agree.

JUDGE PERRAULT: And if he ignores your question, then you can ask it again.

BY MR. CARMOUCHE:

Q. Number 5: "Groundwater to monitor natural attenuation proposed for benzene in one area"; correct?

A. That's correct.

Q. The benzene came from the blowout?

A. It's in proximity to the blowout. How

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it originated, I don't have a fingerprint, I can't tell you exactly. Obviously it's in proximity to that blowout well. The two locations, they're in proximity, so all the information I have, that's where it originated, at that location.

Q. So the benzene has been there for over 80 years?

A. Yeah. If -- if truly it originated back in 1940. In a subsurface environment, sometimes that's not atypical. And so, you know, we're going to evaluate that. Like I told the panel earlier, we want to see -- right now, we just have a "one point in time" for the benzene concentrations. We want to see -- we didn't have any testing data before that first point in time. We want to gather data over time to evaluate that. And then once we do, then we'll be in a better position do we need to do something more than MNA, we'll have that.

Q. At what depth is the benzene?

A. I think that well was screened from about 40 to 50. We can look at it.

Q. Is that in one of your silt lens?

A. Yes.

Q. How far does benzene have to travel to

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monitor naturally attenuate?

A. Well, typically it doesn't travel very far because of monitored natural attenuation. Typically it only goes 150, 200 feet.

If the panel remembers, we have a circle of wells around the blowout, and I think the closest one -- I'd have to look at a map. I can't remember how many feet. But it clearly hasn't made it to -- there's at least -- I think 500 feet's in my mind. There might even be one closer. Clearly it hasn't gone that far. My -- so hopefully I answered your question.

Q. No, but --

A. It typically doesn't go very far. And you might ask, well, why didn't it go very far at this site? There's a low gradient and the hydraulic conductivity's not very high and so it -- groundwater moves quite slowly. And what we see relative to benzene is not -- I think it's fairly typical, I would say. It just hasn't moved much.

Q. All right. So we -- we should evaluate more, it's been sitting there for 80 years and it hasn't moved far but you still want to evaluate to determine if it's going to go away in another 10,

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20, 30 years?

A. No. We just want to gather data to demonstrate we're confident on the groundwater conditions in that vicinity. I'm confident on the classification, the lack of ability of that zone to be used, so we just want to gather the data to demonstrate to the panel.

And so that -- it's more support for, you know, the MFP that we have put together relative to the need for remediation on groundwater besides monitored natural attenuation.

Q. How much would it cost to take out? Did you determine that?

A. To take out --

Q. Take the benzene out.

A. Oh, I haven't made a calculation. I think what we would probably do -- if we get to that point, we'll probably do some kind of oxygenate injection or something, try to degrade it in place if that's ultimately required.

Q. So when you did all this reasonable evaluation for remediation, did you even consider that it might just be more reasonable to get rid of it?

A. No. Because experience -- and I think

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East White Lake's an interesting example where over -- I forget how many years we monitored. It wasn't that long. Benzene did go away, became nondetect in all of the wells.

And so it's not like we didn't look at it, and we -- the -- you know, I think you're referring to the hypothetical. The hypothetical was our attempt to, you know, provide the panel with a companion plan to our primary plan to meet the Chapter 6 requirement. So we have that, but I didn't do just a separate edition for benzene.

Q. You keep bringing up East White Lake. Isn't it true -- and I'd ask the panel to review the file -- that a decision on the groundwater as to what remediation needs to be performed has not been decided yet; correct?

A. Yeah, we can agree on that.

Q. Thank you.

A. We can agree.

Q. There have been -- you're aware of the MRVA aquifer?

A. Yes.

Q. You're aware of the Atchafalaya Aquifer?

A. Yes.

Q. And we know you're aware of the Chicot

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Aquifer; correct?
A. Yes.
Q. In certain cases and instances like this, you've come to the opinion that the MRVA is not -- is poor quality and nonpotable; correct?
A. Yes.
Q. And you have come to the opinion in the Atchafalaya Aquifer that it is naturally poor and not potable, therefore, should not be cleaned up?
A. In certain locations, yeah. And those aquifers -- and Chicot being an example in South Louisiana -- the farther south you get, the base of it becomes salty. And so, you know, that's an example.

And for those of you that have familiarity with the sinkhole -- I unfortunately have a lot of familiarity with it. But at the base of the MRVA there, it is naturally salty as well.

So there can be underground sources of drinking water aquifers that might be 2 or 300 feet thick or even more. Top can be very fresh, potable, but the bottom might not be.
Q. You also have come to the opinion that the sole source of drinking water, Chicot Aquifer,

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in certain areas is of poor quality and nonpotable and should not be remediated?
A. You'd have to give me an example of that. I'm trying to think.
Q. VPSB, higher iron and manganese?
A. That that's -- Vermilion Parish School Board at East White Lake? You described that as the MRVA or the Chicot?
Q. Do you recall -- I'm going to move on. Do you recall saying in the Chicot Aquifer that it should not be remediated due to oil field contamination because the Chicot was poor quality and nonpotable?
A. Oh, yeah, at East White Lake. And I'll be happy to give you a little bit of information. East White Lake, we, as part of the DNR's most feasible plan, implemented an extensive background study. We drilled wells to 300 feet, monitoring wells, sampled them for two years, gather a background data set, and it told us that the background water quality in the upper sand, it wasn't the fresh portion of the Chicot. The upper portion in that case was naturally salty, chloride was well above 250.

It was more than iron and manganese. It

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was chloride, TDS. And all of that's in the groundwater submittals that we made to the agency. So that's an example where the upper part -- the upper sand there is nonpotable because the constituents are above the secondary drinking water standards.
Q. Finished?
A. I'm finished.
Q. So representing oil companies over the 20 years with the Office of Conservation, you have said, due to oil field contamination, do not remediate shallow groundwater, you have come to the opinion, due to oil field waste, you shall not remediate the MRVA, you shall not remediate the Atchafalaya Aquifer, and you shall not remediate the Chicot Aquifer. That's been your opinion; correct?
A. Well, there's a lot more than just those simple statements -- those five statements. I can tell you that these shallow zones like this one, I have recommended no remediation for those for some of the same reasons we've talked about today.

The other -- the other aquifers, the example of the Chicot, I think I gave you East White Lake.

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Atchafalaya, maybe you're thinking of LA Wetlands or New 90. These are other legacy cases. I think the Atchafalaya over there is naturally a little bit salty, but we could go through each one and...
Q. We --
A. We look at them individually. We gather the data. But what I can say from a broader statement, that these shallow water-bearing zones are quite similar relative to I haven't recommended remediation for, in some cases, a multitude of reasons, just like this site.
Q. You haven't -- and they've heard your experience with groundwater remediation. You haven't, in 20 years of being in Louisiana -- because you're from Texas -- in Louisiana, you haven't recommended one groundwater remediation in 20 years?
A. Yeah. And there's -- like I said, there's good reasons for that in these shallow water-bearing zones. And I would say it's somewhat unique in the groundwater remediation arena because of the nature of the shallow soils in Louisiana and the constituents we're dealing with, which in a lot of these are chlorides.

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So the more active pump and treat remediations and those other more sophisticated remediations typically are done for constituents that are a lot different than chloride.
Q. You also talked about Statewide Order 29-B, and you brought up some decisions, so I want to go through some of them.
Agri-South?
A. Yeah. Agri-South is one that I'm familiar with, but I wasn't -- I didn't provide testimony.
Q. But you talked about it and you use it to support your opinion; correct?
A. Well --
Q. That's the root zone?
A. I put it on the chart in the root zone, and I'll be happy to answer the best I can, based on my knowledge and why we put it on that chart.
Q. Do you know if -- well, let's just look at it.
MR. CARMOUCHE: Can you go to the...
BY MR. CARMOUCHE:
Q. So did you go and read the written reasons of the most feasible plan?
A. Yes, at one time, I have. I've read

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them all. There's a lot of them. I made that summary chart. But at one time, I haven't, so I'm happy to look at it again.
Q. And it was argued by the polluter that -- similar to what you're arguing today, that you should not excavate deeper than 3 feet because of the root zone; correct?
A. Yeah. And this my memory -- and we can talk about it, but there were competing root zone studies in that Agri-South opinion, and I think the panel -- the DNR panel at the time ultimately made the determination of an 8-foot application of the 29-B salt standards.
What I can tell you, I'm aware of that there are salt exceedances deeper than 8 feet. And so there were competing root zones. I'm not sure exactly how the panel came to their decision, but I am aware of that at the time. Both sides did a root zone study.
Q. Let's go to the next paragraph. "There's no depth limitation included in the 29-B salt standards."
Do you agree with that statement?
A. I -- well, it doesn't say that specifically. I think that's the -- whoever was

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the author of this. I don't --
Q. What do you mean -- I'm sorry. Go ahead.
A. In 29-B, I'm not familiar of that statement specifically in the 29-B. I'm familiar with this written language here, but I am also familiar with how it's been implemented in practice relative to the application depth.
And in this example you're giving me here, it was applied deeper because of the root zone evaluations by both parties, so it was a site-specific evaluation that was done. But I'm aware of this language in this document.
Q. So when -- when a situation disagrees with you, it's site-specific?
A. No.
Q. Is that what the statement says written by the Office of Conservation in their written reasons? Did I read that --
A. Yeah, you -- yeah. But you implied this was in 29-B, and I'm not aware this particular statement was in 29-B. I'm definitely aware it's in here.
Q. Sir, I asked you if it was in this reasons. I'm not --

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A. I don't disagree. It's right there. And I've read it because I wanted to understand at the end of the day what was selected, what depth did the panel at the time look to to remediate salt, and it wasn't to below this 8-foot depth because I looked at some of the data and there was salt below the 8-foot depth, so there was a decision made --
Q. Right.
A. -- which didn't --
Q. You're not going to 8 feet in this case, are you?
A. No. Because our root zone study didn't define a depth of 8 feet, or the panel didn't make that determination.
JUDGE PERRAULT: Counsel, for the record, what are you referring to? What is this?
MR. CARMOUCHE: This is the most feasible plan of Agri-South that he brought up.
JUDGE PERRAULT: Does it have an exhibit number?
MR. CARMOUCHE: No, sir.
BY MR. CARMOUCHE:
Q. It also says: "Salt" -- oh, I'm sorry.
"Salt parameter exceedances below 3 feet

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must meet the 29-B standards"?
A. That's what it says. That's what the language here says. Unless there is an exception for proof of good cause; right? And obviously, I assume, at the time when the determination of the application of the root zone, there was some determination that a deeper depth was appropriate but not an unlimited depth, because that's when you start looking at reasonableness and feasibleness relative to a parameter that's an agronomic parameter.
Q. So let's go to what they decided.
Let's go to this one. So Dr. Provin testified, which they supported, that a rooting depth of cotton will be to 3 to 5 feet; soybeans, 2 to 4 feet; corn shown a depth 3 to 5 feet.
Did I read that correctly?
A. Yes, that's what it says.
Q. Dr. Provin said he would remove the entire soil down to at least 10 feet; correct?
A. That's what he says there.
Q. You go to the next page. The Office of Conservation did not do the first foot and a half, they decided to have them remediate to a depth of 8 feet; is that correct?

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A. Yeah, that's what I remember, the 8-foot depth.
Q. And it actually says: "Whether remediation to a depth greater than 8 feet may be required in some future time will depend on whether the shallow groundwater monitoring results, field inspections, and analytical results from soils indicate the elevated salt levels have failed to come down within the limits after the initial remediation"; correct?
A. Right. That's what it says.
Q. So they not only excavated down to 8 feet, they said if there was proof that below 8 feet was -- had a potential of leaching into the shallow groundwater, then more soil might not need to be excavated. Is that what it says?
A. That's what it says. I know there's been a lot more work, subsequent work on Agri-South. I think the DNR was involved issuing an order. I haven't tracked that site in those kind of details.
But I do know from looking at the details, when I first looked at the MFP, there was deeper salt below the 8 feet, and so I think -- I just don't know where that one ended up.

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Q. And you mentioned earlier that 29-B does not have -- Title 43 does not have a groundwater remediation standard. It actually does, right, in Chapter 6, background?
A. Well, I wouldn't call it a -- to me, it doesn't jump out at me that that is the 29-B standard. I know that since there are no standards in 29-B, that's been the -- you know, the discussion and why we -- and the panel has used RECAP back to Poppadoc because there are no standards.
And background -- as you probably saw on that one comparison slide, remediation to background has just not been a determination that the panel was -- or the DNR has made historically.
Q. So if they have made that decision in an aquifer that was 3,000 feet down with four aquifers above it and someone was made to remediate it to background, chlorides, that would shock you?
A. No, I'm aware of it. I'm aware of what you're talking about, I think.
Q. So why didn't you tell the panel? Why didn't you tell the panel that?
A. Well, this is a -- I think this is a

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site that Mr. Miller's firm worked on. I'll be happy to look at the documents. I've looked at them. It's a deep 3- or 4,000 feet. I think City of Baton Rouge uses the water out of it. I'm not totally familiar with the details. I'm sure Mr. Miller can talk more about it, but I know it's a deep water-bearing zone, it's a -- I think it's a USDW in the area.
That's a completely different situation than what we're talking about. That's Mr. Miller's example. That's -- I didn't -- I didn't do that work, but I'm familiar with it.
You were asking me about sites that I -- I think implying that I did the work on. I didn't do the work on that one.
Q. You told the panel earlier that you did the research and that you're not aware of a groundwater remediation of chlorides in any aquifer, is what you said?
A. In the -- well, I'll be happy to put my slide up. There's four examples that I've showed the panel where chloride remediation has been done in a similar zone like we're talking about at this site.
If you want to extend it to that deeper

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zone, I can tell you what I know about it. It was primarily a focus on benzene at that location. But I think the ultimate goal, since it was a USDW, to take it back, but that's not a site that I worked on.

There's no mischaracterization. My objection was to tell the panel where I'm aware of attempts have been made in the shallow water-bearing zones, which is what we have here, so -- and that's what I told you.

Q. Your team, including Ms. Connelly, you talk about that it is unreasonable to excavate soil past the root zone because you can destroy the ecology. You've been -- that's part of y'all opinion; right, ERM?

A. Yeah. And I think that's Dr. Connelly's opinion because I'm not an ecologist, but...

Q. Now, in Louisiana, UNOCAL, or Chevron -- and I think you were involved -- excavated soil down to 17 feet?

A. I'm aware of what you're talking about, yeah, and --

Q. And the original proposition or opinion was that you should only have to remediate 2 to 3 feet.

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A. Yeah.

Q. Correct?

A. Do you want me to explain?

Q. You can explain it, but if you could answer my question.

A. Yeah. Correct.

Q. Okay. Now you can explain all you want.

A. There was a site where I was -- I was involved with where an attempt to reclose a pit. It was an open pit, and so there was some testing done by another consultant, HET did the testing.

Shallow testing in the bottom of the pit told us that it didn't feel like there was anything in there that we would have to address. Of course, that testing was shallow testing. They did it. We followed up, actually did the remediation. I didn't lead it. Mr. Upthegrove did, ultimately led us to excavate that location deeper than was known.

And the main reason why is the original testing just -- we just missed it relative -- but we didn't miss it because when we did the work -- when you do the work to reclose a pit, you scrape the bottom to make sure that you get it.

And when we found that, we took it on

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down. And so that particular example where the initial testing didn't tell us, we -- so that's -- that's -- if I answered your question, that's the 17-foot example, the one that I'm thinking of, unless you have another one.

Q. So your company, or the company you're involved in, excavated soil to 17 feet, 1 foot less than what ICON says we ought to excavate here. So is that -- is that -- are you still of the opinion that it's unreasonable?

A. No. That was an open pit, and so we -- you know, obviously under 29-B, open pits must be closed. So when you close a pit, you've got to -- you know, the original testing told us one thing. We got in there and started working, it, like, told us something else, so we had to go in there.

Q. There's nothing in this book that says it has to be an open pit, that you have to clean up a pit to 29-B, does it? Does it?

A. No, it doesn't. I'm just explaining what we did at that site.

Q. I got some pictures. Maybe it will refresh your memory.

A. Oh, I'm well-aware of the -- I've seen, them, and I -- hopefully I explained what my

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recollection is of what was done out there.

Q. So this is before the excavation; correct?

A. Looks like it. I mean, I see a board road.

Q. And so the panel can see, the vegetation around where it's scraped, trees, magnolia trees, all kind of vegetation; correct?

A. Yeah, I see the vegetation. Keep in mind, we have -- we're involved in these oil field sites that are typically -- a lot of times in the woods. And so when you have an open pit, it's a -- something that has to be closed per 29-B. Sometimes you get into these sites, you have to make a path in there, and so this was what was done to access it.

Q. Make a path? Show the next picture. The next one.

This is the hole. Y'all dug the entire area, including the vegetation, down to 17 feet; is that true?

A. That's -- that's exactly right because, like I said, it was an open pit and we need to address any pit contents. And I'll give you another example. Up in North Louisiana in the

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Tucker site, we had a similar situation. We did some testing, said, hey, we need to do some soil-removal, and we found some deeper material, and we went on down and we took it out.

Q. Y'all --

A. But we didn't have the testing like we have at this site, trying to imply that this is the same. That was an open pit in Tucker. These were open pits, and so we had justification and good reason to go in those because they needed to be closed. They were still open.

Q. You hauled this material off?

A. Yes.

Q. Costs millions of dollars?

A. I'm not aware of the cost. Mr. Upthegrove, I'm sure --

Q. A lot of dirt?

A. Correct. That's correct.

Q. Last question on this site. Who owned the property?

A. Who owned the property?

Q. Who owned that property?

A. I think it was BP that owned the property because Chevron -- I was working for Chevron. This pit, this open pit, dated back --

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this Anse La Butte Field dated back, I don't know, I think even before the first photos. It's been in the woods for years.

And so it was discovered, it was actually outside the boundary of the litigation. And so it ultimately ended up being closed, but it was on BP property. So if it -- I'm not sure the property matters because if it was an open pit, it needs to be addressed. It doesn't -- the property boundary wouldn't matter in my mind because when you have an open pit, we're kind of obligated per 29-B to close it unless we request passive closure from the agency.

Q. You showed this LDNR most feasible plan. And again, I just want to, for the panel's sake, the top from Tensas Poppadoc to Vermilion Parish School Board, those are the old cases that limited admission would not apply to? If you know or you don't know.

A. I think that's right. I can't remember when -- on the limited admission side. I mean, we'd have to look at them. I know Poppadoc wasn't, though.

Q. So maybe we can correct some things and we can X them out. "Agri-South, use of root zone

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3 feet remediation depth, check." We know that's wrong now; right?

A. No, we don't. We just looked at the --

Q. We said 8 feet -- I'm sorry.

A. Use of the root zone. Why did they use -- why did the panelists use root zone? Because they had root zone information, site-specific root zone information by two parties, so keep that checked.

Q. Vermilion Parish School Board. We don't know the answer to this yet; right?

A. We do not. We are getting closer. We do not know the answer to that yet. What I can tell you that we do know is the background there is poor quality and we've got a good data set, four different zones, down to a depth of 300 feet.

And so -- but we don't -- I agree with you on we don't know DNR's final determination yet.

Q. And you worked with the root zone people to design your remediation; correct?

A. I don't know. I'm not sure what you mean by --

Q. Well, you looked at it as well? Are you solely relying upon their opinion?

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A. I'm not a root zone guy. I'm not a botanist or a plant guy. I rely on their input, on their determination, Dr. Holloway and Mr. Ritchie. So I do rely on that. They provide us input on -- and I think I referred the panel -- or we talked about earlier when we have a zero to 2 exceedance -- the initial sample, we had a zero to 2 salt exceedance. So their guidance would tell us: Well, go back out and collect these zero to 1, 1 to 2, 2 to 3, let's see where that salt is. And so we rely on that.

And then when they're making a determination of a 1-foot depth, we rely on that relative to their opinion of the root zone as well as the -- I guess the ability of that soil to grow whatever you want to grow.

Q. But you showed a slide, you said effective root zone. Is that your opinion? Or you -- it says zero to 2 feet, I think.

Is that something that if they're wrong, then you're wrong? I'm trying to understand on -- you're cleaning up from zero to what?

A. Our plan as presented in the remediation plan, Section 10, is no soil remediation for -- that's based on a 1-foot root zone. I went

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through three locations of -- if there's some -- you know, we've got this judge ruling that came out fairly recently, and so we're grappling with that.

And so we have identified to the panel three locations that had slight exceedances between 1 and 3 feet that are below Mr. Ritchie's root zone but are locations that are exceedances.

Q. So if they're wrong, you're wrong? In other words, if the root zone for several trees or plants that could be at this site can be planted in the future, then if they have miscalculated that, then you're wrong?

A. For what we have proposed. But I think I pointed out to the panel, and I would encourage the panel to look at the salt data below the root zone, in particular 1 to 3 feet. And I'd also suggest looking at down deeper. I think the deepest root zone in any of these was the 8 foot, you know, where they're competing experts, but that -- so I looked at all of that data, and I suggest that you do, too.

But that's where, you know, I did rely on Mr. Ritchie for our opinion that we don't need to do anything relative to salt within the root

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zone.

And so I guess if Mr. Ritchie, someone evaluates and has a difference of opinion, then, you know, I guess we'll have a different plan that would come out from the agency, but I hadn't seen a competing root zone, so...

Q. Have you been to tree farms before?

A. Tree farms? No.

Q. There's one in New Roads. I don't know if you've been there. They've got --

A. I haven't been to that one.

Q. They have these boxes with these oaks trees that go down to the bottom of the root zone. Are you aware of that?

A. You happen to --

Q. Let's show a picture. Have you ever seen something like this?

MR. GREGOIRE: Judge, I object. He just said he is not an agronomist, and he's certainly not here to render that opinion. Now Mr. Carmouche is showing him a tree, and he's going to proceed to ask him about the roots. He had that opportunity with Patrick Ritchie, the agronomist --

JUDGE PERRAULT: What's the relevance of

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this?

MR. CARMOUCHE: I'm not asking him his opinion. He talked to this panel and relies upon that the root zone is from zero to 18 inches. I'm simply asking him a fact, not an opinion. I think the panel needs to hear it. It's relevant information.

JUDGE PERRAULT: This tree, is it on the site?

MR. CARMOUCHE: No. This is a tree farm that's everywhere.

JUDGE PERRAULT: I'm going to uphold the objection.

BY MR. CARMOUCHE:

Q. Do you know how deep an oak tree's roots go?

A. I'm not the root-zone guy, I'm really not.

Q. Would it shock you if just a simple, even, tree you buy at the store is 4 feet?

A. No. The only thing that I've seen is over the years that -- the root zone studies that Dr. Holloway and Mr. Ritchie have conducted. That's what we rely on. And what they determine is what we rely on. I don't do that piece of the

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work.

Q. You talked about water wells that are not used in this shallow zone. And you talked about one mile. Do you remember that?

A. Yes.

Q. Now, let's talk about -- maybe your statement is just honed in on 1 mile, but I want to make sure I understand your opinion.

Are you saying that in -- because the aquifers found at this site are called channel sands; correct?

A. That's not -- I disagree.

Q. You disagree?

A. There are silt zones that vary in thickness, and I think there's a couple boreholes -- and I'd encourage the panel to look at the boring logs. There's only a few that have actual sand in them. You called them channel sand. I think that's a mischaracterization of them. They're primarily silt. They're fine grain.

Q. And we'll go through what the wells produced and how many thousands of gallons a day they produced that you determined.

But my question is: Did you do and try

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to understand South Louisiana similar channel sands -- or whatever you want to call them, silt lens -- to determine if that aquifer is being used for domestic purposes, agricultural purposes, or any purpose?

A. I did a thorough search within a mile radius of this site. And as you see in the cross-sections, these silt stringers are variable and discontinuous. And what you also see when you look at a mile radius, you don't see any water wells completed in that zone.

And so that -- the 1 mile is not a magic number. That's specified in RECAP. And that's reasonable, in particular for shallow zones that are discontinuous like this.

So that's pretty prescribed. I mean, sure, in South Louisiana, if you go 100 miles away, could someone have a different depth well? But it doesn't particularly add much relevance relative to the site-specific evaluation you do on a property like this and look a mile radius.

Q. So then I'll rephrase it. So when you say that a shallow aquifer with this type of lens is not used for drinking water -- for domestic supply or agriculture supply or other supply, you

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just mean on this site and within 1 mile? You don't mean that across the state of Louisiana?

A. No. No. It's just like the Chicot Aquifer doesn't underlie the entire state of Louisiana. It's a -- site-specific. But we have good site-specific data here. Not only site-specific, within a mile radius, so we're pretty comfortable on who's using it and not.

Q. So then maybe we can agree on something today. So just because it's a shallow aquifer in Louisiana -- we'll agree to disagree at this site. But just because it's a shallow aquifer in Louisiana doesn't mean you just write it off as nonusable; correct?

A. I didn't say that at all. No. You evaluate it. You evaluate the utility of it, the potability of it, the depth of it, all of the things that we talked about.

In our evaluation, we walked through all of those, which tells us that this particular water-bearing zone underneath this site hasn't been used and it's not potable. We have that site-specific data.

Q. You also said that -- talking about water wells -- "cannot sustain recommended flow

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rates of 6 to 10 gallons per minute for home. Private Water Systems Handbook." That's what you quoted; correct?

A. Correct.

Q. But the state of Louisiana has in RECAP actual rules that we have to follow to determine what Louisiana classifies as what can be used as a domestic water well or an agricultural water well; correct?

A. Yeah. We -- again, we look to RECAP -- we used RECAP to do the groundwater classification at this site.

Q. Okay. Well, let's look at RECAP.

A. I didn't use those handbooks to do groundwater classification at this site.

Q. So this is a Groundwater 2. And that's Mr. Miller's opinion -- right? -- that this is a Groundwater 2?

A. That's my understanding, correct.

Q. Okay. And a Groundwater 2, A, B, and C, is groundwater within an aquifer that could potentially supply drinking water to a domestic water supply; correct?

A. That's correct.

Q. And even if it has 1 and less than

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10,000 milligrams of TDS?

A. That's what it says, correct.

Q. And if you correlate -- I mean, 10,000 milligrams of TDS, that's a lot of chloride; isn't it?

A. You know, I don't know what your word "a lot" is.

Q. Over 600?

A. Seawater has 19,000, so it's about a little more than half of seawater. 10,000.

Q. So Louisiana decided that Louisiana's going to protect an aquifer and call it a drinking water aquifer with chlorides as much as 10,000 milligrams per liter?

A. Well, it says TDS. That's not chlorides. The chloride number would be about, you know, 5500 or so, maybe 6,000, so --

Q. 5500?

A. Right. And that's what the Class 2 classification says, that's correct.

Q. But they call that a drinking water. It says: "Groundwater within an aquifer" --

A. It could potentially supply. I don't disagree with what it says. We have a disagreement on it's a Class 2. I don't disagree

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with what it says.
And I'll take it a step further. The classification is one thing, which we went through in exclusive detail, but then you've got to look at the practicality and the reasonableness of the remedial decision, and that's a separate thing. We went through that, too, all the justifications why you don't remediate the shallow zone. So, hey, we follow RECAP for classification.
Q. Let's go a little step further because maybe I misunderstood your prior testimony.
Note 3: "A yield of 800 gallons per day is approximately the median yield for an underground source of drinking water as defined by EPA"; correct?
A. That's what it says.
Q. And it goes on to say: "150" -- so there's a median of between 150 and 1440 gallons per day?
A. Yeah. And I think, you know, this 800 gallons per day obviously is the RECAP Class 2/Class 3 break. And that's in the RECAP regulation, so I'm aware of it.
Q. And they reference that an aquifer at 150 gallons per day, they recognize could be used

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for domestic purposes?
A. Again, I don't disagree with what it says. It's -- from a practical standpoint -- I think the panel's heard from a realistic standpoint, but that's what it says relative to doing our RECAP evaluation, which we went through -- or Ms. Levert went through evaluating the data relative to RECAP.
Q. So with regards to that and looking at the -- let's see if we can agree. You would agree that if a shallow zone in Louisiana can yield 800 gallons per day and has TDS less than 1,000 or 10,000, it's declared a groundwater within an aquifer that could potentially supply drinking water. Can we agree on that?
A. I'll agree on that, but at this site, we have sulfate and other things that go beyond that. And so if you just look at that in isolation -- so you've got to look at the other data to determine, okay, is this really going to be a drinking water considering -- it's not just TDS, and so that's the difference. The TDS is used strictly to classify groundwater.
Q. Right. We're talking about classification.

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A. That's what I'm talking about, correct.
Q. So you would agree with that?
A. I agree on the classification side but being drinking water is taking it a step further because we have the testing results to show us this water's not potable drinking water.
Q. Okay. Let's take it one step at a time.
So you would agree 800 gallons a day, 1,000 or less than 10,000 TDS, is a Class 2?
A. I agree with whatever's in RECAP. We can put it up there, and I will agree with what's in that section.
Q. And you're saying it might not be drinking water but it could be used for agriculture or other supply?
A. If that's what it says, and I'd be happy to look at it again.
Q. I mean Groundwater 2 can be used for agricultural and other reasons; right?
A. You can if it meets the requirements of those end uses.
Q. Of the classification?
A. That's what it says. But if you take it a step further, when you look for use of these shallow zones for agriculture -- let's say you

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want to refill the rice fields out there. I mean these shallow zones just don't cut the mustard.
You've got to put -- you know, you need an industrial well like what's out there to make 3500 gallons a minute, otherwise you'd be out there 20 years trying to fill up the rice ponds.
So there's real practical reasons why that -- these shallow zones, that there's other things to consider, and that's what we did.
Q. Let's go try and move on. It's my understanding it's your opinion that the blowout was top to bottom. Did I hear that correctly?
A. I was relaying Mr. Kennedy's opinion, which is in his report, which is attached to our most feasible plan. So I didn't do an independent analysis. I'm not a petroleum engineer. I wasn't trained to do that. But that's what he -- that was his conclusion by -- after looking at the records.
Q. But your expertise is, to look at the data that's collected from the groundwater, you can determine if it was bottom-up or -- I mean top-to-bottom or bottom-up; correct?
A. We looked at the -- not only the ground water data, we looked at the soil, the electrical

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conductivity probe logs, our visual soil logs. As you remember, I told you early on that we collect these continuous soil core so you can see the soil type and everything.

So we relied on those lines of evidence to, I guess, inform us on -- try to understand the concentrations there, so -- but that wasn't trying to understand what caused the blowout.

Q. Okay. If it was -- let's assume Mr. Kennedy says it's top to bottom. Can you explain where the 39,200 parts per million of chlorides came at 50 feet?

A. Yeah. And I think -- well -- and again, I'm trying to avoid speculation here, but if the -- if Mr. Miller doesn't show the pond here -- maybe he does. Yeah, that's it right here. It's right here (indicating). I guess right here.

So we know the pond goes down 15 feet today. We measured it. We took the effort to go out there and do that, but it was probably deeper at some time. And my experience, you know, primarily with the sinkhole is you'll get sloughing at the edges and so at some point, this was probably deeper, is what it feels like to me.

And then we look at conductivity probe

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logs -- I think this is Mr. Miller's cross-section. And when they start coming back down to here, you know you're back down where you don't have indications of salt.

And when you look at the geologic boring logs, I don't think Mr. Miller has our -- we actually redid this. He doesn't have this on his cross-section. But we did what's called an H-12 R. I suggest you look at that boring log because that went down deeper.

And it showed where Mr. Miller stops in silt, we've got clay down here. And so that testing, again, is another line of evidence. So we have more data that's shown on here, but what this tells me is there is chloride in that zone.

And, you know, other than me trying to speculate more, that's kind of the best I can tell you. I rely on Mr. Kennedy on where the blowout occurred. But that's how I have interpreted that data at the -- you know, that well screen.

Q. You're the hydrogeologist, so at either -- 39,200 is one of the highest ones on-site; correct?

A. Yes, that's one of the higher chloride values.

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Q. So it either came from and migrated from one of these silt zones or it came from the bottom or maybe you could tell me where else it might have appeared from?

A. No. We're 80 years post-blowout, and so this pond's full of freshwater. But we don't know what it was or how deep it was at the time. That's -- the likelihood if it happened at the surface, the release would have been at the surface. I think I heard somebody say that, you know, it was spraying all over for a long period of time. Obviously, if there were fluids coming out at the surface, those would have settled down locally.

It could have easily explained this, but we're trying to turn back the clock 80 years. That's my interpretation. But when you look at the deeper geology, we don't see evidence of salt down deep below this water-bearing zone. And we -- and we -- the hydraulic head of this pond is a little bit higher than the groundwater nearby, but the Chicot water level is much deeper, so if this was -- if this alleged connection exists, we'd have potentially a water level that's more representative of the Chicot.

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The wells right around that have water levels representative of the shallow water-bearing zone, in my mind, don't show a connection.

Q. You're saying there's a possibility that the blowout crater hole could have been down to 50 feet and came from the surface?

A. Well, I'm trying to answer your question. That's the best I can come up with. But I can't tell you. What I can tell you is when you go below there, to me, we're back to background and -- when you look at the soil borings, the EC probes and the differences in water levels.

Q. So just so I can -- so we can go to this crater. It's 15 feet deep, and you think it's -- it's not communicating with the Chicot; correct?

A. That's correct. Based on our water level measurements that we surveyed. We had a surveyor go out there, surveyed that and the wells around it. The Chicot water levels, as I showed the panel, are way down here, you know, 30 or 40 feet down.

Q. So by one -- I'm sorry. Go ahead.

A. No. That's -- I just -- there's that one cross-section where we plotted the Chicot

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water levels with the little blue triangles. You know, you can go look at it and you'll see where the Chicot water levels would be.

Q. How did you determine the water level; how did you determine the depth?

A. Of the pond?

Q. Yeah.

A. I went out there on a boat. We had two guys out there on a boat sounding the bottom.

Q. And because of that, we've concluded that the water is not communicating from the Chicot? Is that the evidence you have?

A. No. I'll go through it again.

We sounded the bottom. We looked at the electrical conductivity probes. We looked at the boring logs, which this doesn't show our H-12 R which we found at like 78 feet. And I think we looked at the field EC values. If we don't have electrical conductivity probes, we typically measure what's called field EC in the field. We didn't see indications of salt in the soil column when you go down deeper.

So there's a lot of things that tell us that this isn't -- this thing that's drawn here with no data, I can't support it.

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Q. Also -- so we talk about barium you talked about. You say there's no barium at the surface and you pointed to H-12, 50 to 60 feet, and you found a barium bust; correct?

I'll give it to you. Here you go.

A. I understand.

Q. So we can move on.

A. Yeah. There's -- I think in -- there's two different medias. In soil, the barium, we talked about in soil; so it's at the surface. But there's no barium exceeding a standard in the pond out there.

Q. No. I'm sorry.

A. So --

Q. You showed this slide and you said that there was barium now above 2 drinking water standard in 50 and 60 feet?

A. In H-12, correct, which is this location right here, this screen right here (indicating).

Q. So again, there's no barium at the surface and the blowout went from top to bottom.

Your answer would be the same for the chlorides of why the barium's there?

A. Yeah. The barium -- the 2 milligrams per liter at H-12 is more than likely associated

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with the chlorides or the produced water at that location. So we don't see that in the pond because we've had 80 years of, obviously, let's just call it natural attenuation.

It's truly that pond is back to a freshwater habitat and, you know, I didn't go on the boat, but I've been around it, and I've seen what's growing in there, so...

Q. You would agree that if the Chicot Aquifer is in communication with the blowout crater, that wouldn't be good?

A. Well, we don't have any evidence it is, so, you know, that's going to have to be a further --

Q. I'm asking a hypothetical.

A. Yeah.

Q. That's not good?

A. I would say -- yeah, I agree. I agree. That's like having a -- drilling a water well and not plugging it when you're done and just leaving it open to the Chicot, right.

Q. So it seems to be that since the -- sounds like we don't really know and we're confused, would you be up to suggesting to the panel that they might want -- that it wouldn't be

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unreasonable to go out to determine if the Chicot is actually communicating to the surface?

A. Well, we've given them all the data that we believe tells us it's not. And it's -- of course, they'll have to review all of that data, including Mr. Kennedy's report, but we have a -- you know, we have the water-level measurements that -- in tables. We have the boring logs in an appendix. We have the electro-conductivity logs. We have the field notes that describe and record the field EC measurements. So you look at all that, which is what we did. And I'd suggest you do that. And that's what we used to come to our conclusion that it's not connected.

Pretty good data set because, quite honestly, when you look around there, you know, H-12, we basically redid and drilled it ourselves to a deeper depth, which is not shown on here.

Q. You would agree that Chevron filed a limited admission and admitted that there was environmental damage in certain areas on this property; correct?

A. Correct.

Q. And were you involved in advising Chevron if they should admit that there was

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environmental damage caused by contamination on this property?
A. The only thing we did was advise them on the data and what the data tells us. That admission and Chevron's legal filing, that's not -- I don't produce that. I don't draft that. That's not me. But we do look at the data to determine what it tells us in the different areas and where Chevron -- I look at where Chevron's wells were, where they operated, and the data associated with those. That's my job.
Q. Well, your job is to look at Chapter 6 and the definitions that it says --
MR. CARMOUCHE: Well, let's show it, Scott.
Let's go to this slide (indicating).
BY MR. CARMOUCHE:
Q. These are the rules you have to follow; correct?
A. We try. We try.
Q. And at the top, you can see it says: "Procedures for hearings and submissions of plans in accordance with 30:29"; correct?
A. Correct.
Q. So when you as a scientist are preparing these plans for this panel to look at, you have to

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figure Chapter 6 and 30:29, because it says "in accordance to 30:29"; correct?
A. That's what it says, correct.
Q. And you do that?
A. We tried -- you know, from a technical side, that's what we try to do, we try to meet the requirements of what it's asking us to do.
Q. And let's go to the definition of environmental damage, and I'll just go straight to it. It says: "Caused by contamination" -- I think we've gone over this 100 times. Right here (indicating).
A. "Caused by contamination." Yes.
Q. Okay.
And feasible plan, it looked like your slides cut off a sentence. I think you stopped at "administrative act" right here, so I want to make sure the panel understands the rest of the definition.
It says: "In effect at the time of cleanup to remediate contamination"; correct?
A. Yeah, that's what it says. And also, I don't think it's on here. I don't see the definition of "contamination," which, you know, all three of these kind of have some

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interrelationship between them.
But yeah, I see. The only reason we didn't show that whole thing is it's kind of long, but that's what it says. I don't disagree. That's what -- that's what we look to.
I think I also pointed out on that one slide of mine the definition of evaluation or remediation. You know, what does that really mean? Because these are words us scientists are trying to evaluate the data relative to coming up with a meaning, and so...
Q. Do you see the word "evaluate" in the feasible plan?
A. Do I... No, not specifically. What I do see is reasonableness and, you know, a lot of experience on what a feasible plan is and the definition of evaluation and remediation, so, anyway, I guess we're fighting about words and what they mean.
Q. I'm showing 30:29, which Chapter 6 has to be in accordance with. And I'm going to direct your attention to the definition of "contamination." And my question is: Is that confusing?
A. (Reviews document.)

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No, I wouldn't call it confusing. I mean that's what -- it says what it says. I think a couple key points. It does say "As to render them unsuitable for the reasonable intended purposes."
And so that's kind of where we are relative to a determination of reasonable future use and all of the things we went through relative to soil and groundwater conditions. And so...
Q. So it's not confusing?
A. It's just a word. We try to work within it. But we work more within the data to try to respond to really the end of that definition on the reasonableness or the unsuitable for the reasonably intended purposes.
Q. I know you didn't give the opinion and you're the last witness and we hadn't heard one expert told us -- tell us that they advised Chevron to do it, so Chevron did it.
So you were told before you filed your most feasible plan that Chevron admitted environmental damage caused by contamination and applied this definition; correct?
A. You know, again, that's a legal filing that I didn't make, but if that's what they

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admitted, then that's what they admitted. Our work takes over that and it's like, okay, we're supposed to evaluate this word here as well as environmental damage, actual potential damage. So we don't know for sure until we collect all the data and then determine, okay, what do we do?

Q. I know for sure they filed and signed under oath in federal court --

A. I understand.

Q. -- and said "these areas." So my question is, Chevron admitted this --

A. They did.

Q. -- they admitted this?

A. I don't disagree.

Q. And your plan and all of your testimony this entire week ignores what your own client says is on this property; isn't that true?

A. I totally disagree. I mean, we have taken affirmative position to respond with the most feasible plan to evaluate this property, evaluate the suitability for future intended purposes, evaluate the property like we have on sites, and we're -- why do we do what we do? We're guided by 29-B and RECAP. We're guided by the state environmental regulations, have

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numerical standards and to abide by these words.

Chevron submits this legal document. We do our work to address what we feel needs to be put into the most feasible plan so the panel has the opportunity to review what we have done. That's what I do.

Q. One more question, and we'll move on. You don't agree, sir, that the soil or groundwater is unsuitable for their reasonable intended purposes; correct?

A. That's correct. That was kind of a --

Q. You don't agree -- I'm going to make sure you understand. You don't agree that the soil and groundwater is unsuitable for their intended purposes?

A. That's correct. Based on all of the analysis we've done, not just me, Dr. Connelly, Ms. Levert, Dr. Frazier, Dr. Kind, Dr. Wnek, and Mr. Richie. I might be forgetting somebody. But anyway, they're all attached to our report.

Q. Let's go to soil.

There are specific rules in 29-B that have to be followed to determine if the contamination in soil is going to migrate to the groundwater; correct?

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A. Specific rules to be followed in 29-B? Well, there's a --

Q. In Chapter 6. So when you're submitting this feasible plan, the legislature has set -- and the state of Louisiana has set rules -- not shall, not may -- they say you shall follow the rules of 29-B; correct?

A. I believe so. That's what we try to do.

Q. So let's show 611.

A says: "The commissioner of conservation -- that's this panel -- shall consider only plans filed in a timely manner in accordance with these rules and orders of the court."

Did I read that correctly?

A. Yes, you read it.

Q. So the legislature and people of the state of Louisiana said this panel can only consider rules -- plans that follow the rules here; correct?

A. I just go by the words.

Q. Did I read that wrong?

A. No. I mean whatever's in here is what it says, so...

Q. And court orders?

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A. Okay. I seen it.

Q. We have a court order; correct? You've seen it?

A. We have a court ruling, and I don't know how that compares with an order. But I have seen it. I think we've talked about it, it came out in November. So I have seen it.

Q. B: "Sampling and testing shall be performed in accordance with Statewide Order 29-B."

Did I read that correctly?

A. Yes.

Q. "All Statewide Order 29-B sampling shall be in accordance with applicable guidelines as provided in the latest version of the Department of Natural Resources laboratory procedures manual titled Laboratory Procedures for Analysis of Exploration and Production Waste"; correct?

A. Correct.

Q. You see the word "shall"?

A. Yeah, I see it. Yeah. And that's what we did. We also did -- we did RECAP evaluation because -- we had to because the data that Mr. Miller's firm initially collected was RECAP-type data, so we had to deviate for an

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exception as had been applied. The use of RECAP's been applied back to, you know, really the Poppadoc so...

Q. Let's go to D.

Also says the same thing regarding sampling analysis; correct?

A. Correct. For 29-B. And that's what we followed. I mean we definitely follow this, but we have to deviate to deal with non-29-B parameters. I gave you an example. We also have to deviate when we want to look at a modern risk-based numerical framework, which is laid out in RECAP.

Q. You're familiar with the laboratory procedures for analysis of exploration and production waste?

A. Yes.

Q. Next slide, please.

You're familiar with this?

A. Yes.

Q. Okay. Next.

The "Laboratory procedure analysis analytical methodology reference table." Leachate chlorides test for soil, sediment, sludges, reusable material."

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What method do they say you have to use?

A. Well, they say, here, leachate chloride -- and, again, when you read the text back in 29-B, it describes the use of leachate chloride for a treated waste-type material at a commercial facility, not -- not specifically soil. So there's a difference there.

Q. There's a difference --

A. In the --

Q. They know the history of their --

A. Right.

Q. There's a difference. So you're saying for soil, am I reading that correctly? Soil?

A. I'm not -- yeah, I agree with whatever that says, but I also encourage the panel to go back and look at the section that talks about how leachate chlorides apply to the waste material. It's treated waste material, as I remember. I'd have to see it to -- and I can show you.

Q. So the waste -- so they determined leachate chloride tests for waste that's treated to determine if it's going to -- I'm just taking your opinion as true.

So they determine if wastes, at the surface, of chlorides, through a leachate test, is

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going to go to the groundwater?

A. I think it's for stabilized material, stabilized wastes, or --

Q. Of chlorides?

A. Correct. But different -- it's not soil. It's -- the way 29-B describes it -- I think it's the commercial facility section describes the leachate method.

Q. Why didn't they exclude soil and sediment?

A. I don't know.

Q. They have reusable material?

A. Right. I don't know that.

Q. Did Mr. -- you didn't use leachate tests; correct?

A. No. We looked at Mr. Miller's -- we -- we used SPLP chloride as one tool that -- I guess tool in the toolbox, as you probably heard, we probably used a half dozen other tools to evaluate chloride and distribution in the transport both of soil and groundwater, so...

Q. If Mr. Henning decides to dig a pond in the areas of contamination deeper than 2 feet --

You understand where --

A. I understand.

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Q. All right.

-- and that waste which we have seen exists, when he excavates it, does he then have to call the Office of Conservation and treat it as E&P waste and haul it to a commercial facility?

A. How deep's he digging?

Q. 18 feet.

A. He would -- there's a couple of issues here. And you're just -- it's kind of a broad statement, but there's only about an acre of soil out there that has -- or that's being proposed, I think, by Mr. Miller to be excavated.

And so assuming that -- there's a lot of assumptions. Let me just go through them. You have to assume you're going to build a pond right in the heart of some of these former operational areas. And I'm going to get there.

Some of these operational areas have multiple steel casings in the ground, so you're going to have to assume you're going to go in there and build a pond to 18 feet and excavate this material out.

So what you'd want to do is look at the concentration data not from just the highest location but all of the locations in that vicinity

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relative to the size of the pond and say, okay, when we dig all this soil up at this massive pond and we take a composite of that, is that going to fail 29-B?

In my, you know, opinion based on the data that we've seen out there, probably not, because of the volume of soil that you're going to move. If you're digging to 18 feet in an area to generate a large pond, you're going to move a lot of soil. And when you move a lot of soil, you basically -- you're going to see a lot of changes in things.

And we know -- you might say, well, how do I know that? Well, when you look at data from locations that are tested in these same operational areas and don't really have any salt in them, you're going to be mixing that soil from those locations with a location maybe from the hottest location.

So that's kind of the best I can do to respond to you there. I think you'd probably almost have to start with the fundamental question of what do we do about, you know, a series of wellbores, a well plugged, that are 5 feet below the ground surface when I'm digging a pond to

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18 feet? If I need to get back into them, how do I do that if there's a need in the future to do that.

So that's where I'd start, and then I'd work from there to ultimately determine what you do with the soil, but...

Hopefully I answered your question.

Q. You don't have the right under RECAP or 29-B to tell Mr. Henning how he can use his property and where he needs to dig and not dig; correct?

A. No. That's not my job. That's his property.

Q. And even to take it a step further, if Mr. Henning for some unfortunate reason passes away and his kids can't afford the estate tax and somebody buys it and this -- this is not in the public record and someone goes out there and digs a pond and then determines that it's E&P waste, is "probably" sufficient?

Is that -- should that person then call you? Should that person call Chevron? Or should that person call this panel?

MR. GREGOIRE: Judge, we're getting into the area of speculation and hypothetical.

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Mr. Carmouche is asking this witness about questions with evidence that does not and will not exist in the record.

MR. CARMOUCHE: This -- the whole basis of the regulation is land use. That's what we're talking about. And it's not just Mr. Henning's land use. There's nothing -- and I'm going to lay the foundation, if you want me to lay it, Judge. There's nothing in this regulation that says anything about the current property owner. If you want, I'll do that right now.

JUDGE PERRAULT: Well, let's just stick with what we've got. I think you're getting too far afield with speculation, and I'm going to uphold the objection.

MR. CARMOUCHE: So, Judge, you're not going to allow me to go through the regulation that talks about --

JUDGE PERRAULT: You can go through the regulation, but you're asking him to assume what's going to happen years in the future.

MR. CARMOUCHE: That's what the regulations make you do.

JUDGE PERRAULT: Well, the panel can read the

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regulation. But to assume facts that aren't in evidence and may or may not happen isn't helpful.

MR. CARMOUCHE: That's what the regulations say you do, and that's what he did. He's assuming -- when he talks about the use, he's -- they all testified that they're assuming that Mr. Henning's not going to use the property like this in the future. That's their opinion.

JUDGE PERRAULT: Let's just go with what the regulation says, and let's not assume facts that we have no idea are going to happen.

You're asking him to respond to facts that may or may not happen.

MR. CARMOUCHE: I'm saying, Judge, under the regulations, he has to assume, he has to assume. I'll go through the regulations.

JUDGE PERRAULT: Let's just stick to the regulation. Let's don't choose facts that may or may not happen. Let's go with what the regulation says.

BY MR. CARMOUCHE:

Q. Let's go with the regulation. Okay. Let's go to 2.9.

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There's nothing in -- this is land use in RECAP; correct?
A. Yes.
Q. And it actually says: "The current and future land use shall be determined in order to characterize the activities and the activity patterns of the potentially exposed population."
A. That's what it says, correct.
Q. "Current and future land use category assigned AOI is subject to department approval."
So it's a requirement by the regulations that you apply that the future -- current and future land use, future not having a time, it's forever, you must characterize the activities; correct?
A. Correct.
Q. Okay. All right.
And to get -- to move this along, there's ways to characterize it, you characterize it as industrial and nonindustrial; correct?
A. Correct. And I think Ms. Levert analyzed it as, you know, potentially residential for the future from a RECAP standpoint, which is what we're talking about right now.
Q. Go to the definition of "nonindustrial."

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"Nonindustrial land use refers to any property that does not meet the exclusive definition of an industrial property. Such properties may be residential, recreational, farming, livestock, or vegetative or undeveloped lands that are not included in the industrial property description, private-owned lands, wetlands, state and national parks"; correct?
A. That's what it says, correct.
Q. Does it say anywhere in this definition that you restrict the land use and only consider the land use of what the current operator is using it for today?
A. No, it doesn't say anything in there, but it's something you've got to consider. You've got to consider the historical uses and potential future uses. I think we've gone through all of that, and the decision was made in 1940 to make this an oil field.
And I think in 2017 when, you know, this -- the simple act of let's say you wanted to buy this property, your bank says you need to go out and do a Phase 1. Guess what? They're going to tell you this is an oil field. So you're on notice that it was an oil field, and so how it's

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been used or how it might be used in the future, I think that's all pretty well spelled out in what we have talked about, you know, either me or others.
Q. You went over your contingency plan. I think Mr. Olivier asked the cost, so I want to make sure we answered his question.
ERM hired a company called Diversified Enviro Products & Services; correct?
A. Yeah, the contractor. I don't know if you'd call it hired. We get assistance from them and they do remediation work to help us hone in on a more accurate or closer cost estimate to do hypothetical work, so to speak, which is what we had done with the hypothetical plan.
Q. So you got an estimate -- or somebody got -- it says it's to ERM. ERM got an estimate from this company to excavate these areas that are, what, in violation of 29-B?
A. These -- this estimate was done -- and it's attached to the hypothetical plan -- to provide us a cost basis to calculate that plan based on the areas that I showed you on the figures to either treat, excavate, restore, where our objective was to try to be fully compliant

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with salt concentrations at depth down to a depth of 32 feet. That's what, as I remember, this was used for.
Q. Okay. So 29-B?
A. Yeah, 29-B.
Q. That was my question. All right.
And that cost, the last page, is $5,000,570?
A. Yes. Again, this is for the hypothetical plan to excavate salt to a depth of 32 feet.
Q. Okay. Did you get an estimate to excavate to 18 feet?
A. Well, not all areas go to 32 feet. Some go much shallower. So it's area by area. Specifically we didn't tell the contract I need a depth estimate to 18 feet. I didn't have that hypothetical, so...
Q. So this is not all to 32 feet. This is different levels?
A. It's different levels depending on where we had exceedances. I think the deepest was 32. Other places, it's not near that deep, so it varies depending on where the exceedances were.
Q. Let's show ICON's.

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We don't have the 32 feet?
That's okay. Let's just show...
So ICON's remediation to -- for soil to 18 feet is $1,000,033?
A. Yeah. That's with exceptions. This is one of the ICON cost estimates with exceptions to 29-B. You can see, I think, at the -- there's another one without exceptions that actually goes to 32 feet.
Q. Do you know what -- he'll go over it, but it wasn't $5 million?
A. No. I think that there's differences on how those were calculated relative to the feasibility and what you might have to do to actually dig to 32 feet. I'm not sure. Some of that engineering work was -- I'm not sure -- I think Mr. Miller's guys that did this calculation didn't even go to the site, and so understanding how to, you know, physically engineer an excavation to 32 feet to, you know, prevent the sidewalls from caving and all of that stuff, I think that's probably where we differ.
We'd have to look specifically at which areas and see if we had agreement there, but I think there are some differences. And hopefully

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that's an explanation why we might have them.
Q. Right. ICON's cheaper?
A. Yeah, I wouldn't say cheap, it's just a --
Q. "Cheaper," said.
A. Oh, yeah. Well, I agree it's a lower price. Is it feasible as it's written? I don't know. I'm not sure. You know, I'm not sure that the guys that wrote it, since they hadn't been out there, considered is it safe to dig to 32 feet without any shoring or anything? I don't know. That's probably a question you probably need to ask them.
Q. Well, I think, if you -- so the panel will know, I think ICON only recommends digging 18 feet, not 32.
A. Well, they've got two plans, so I guess that will be a question to ask them.
Q. Well, because the rule says you have to give a cost to meet 29-B; right?
A. Right. And --
Q. And --
A. Maybe they're doing --
Q. He'll explain.
A. I assume he will.

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Q. Can we agree that Mr. Purdom is incorrect, so we can move on, that the shallow water is an aquifer?
A. I think -- yeah, there was some confusion. I'm glad you brought it up. Mr. Purdom, I think when you asked him that question, I remember it, and then it was a back and forth. And I think where he ended up, you know, I think he said a drinking water aquifer or whatever.
So I think the only -- he would be a better guy to ask this. But the only thing I can think of, he's thinking, okay, is this really a drinking water aquifer? I don't believe it is because it's -- I wouldn't drink it. I consider it nonpotable.
Is it an aquifer? It is an aquifer. Is it a usable aquifer? No. It's just a word, though. We evaluate more than the word.
Q. I understand.
But when we talk about the shallow groundwater, it's an aquifer?
A. Yes.
Q. Thank you. All right.
You would agree that --

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A. But it's not a named aquifer -- I apologize.
Q. I understand.
A. It's not a named aquifer like a Chicot or Evangeline or you know, something -- the Wilcox up in North Louisiana, some of those. It's just it's not --
PANELIST OLIVIER: If I can ask, too -- oh, whenever we get to a good point. I don't want to interrupt.
MR. CARMOUCHE: Let's take a break.
PANELIST OLIVIER: Can we take just like a 10-minute break for the restroom?
MR. CARMOUCHE: Yes, sir. And it will help me maybe speed it up.
JUDGE PERRAULT: Are you ready right now?
We're going to take a 10-minute break. We'll be back at 2:45.
(Recess taken at 2:34 p.m. Back on record at 2:46 p.m.)
JUDGE PERRAULT: We're back on the record. It's 2:46, February 8, 2023. We're doing the cross-exam of Mr. Angle.
Please proceed.
BY MR. CARMOUCHE:

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Q. I'm going to direct your attention to Chevron's most feasible plan. It looks like page 6.

And if you look at the second sentence highlighted but the sentence before, you would agree that the shallow water-bearing zone, you describe as discontinuous silt stringers between the depths -- my question's the depth -- from 20 to 62 feet?

A. Yes, generally. The shallowest depth there is those wells that are far out to the east, so we wanted to fully incorporate those. But the ones on -- Areas 2, 4, 5, and 6 are generally about 30, but I don't -- yeah, that's the range.

Q. And you would agree that -- and we clarified that the silt stringers -- I call it an aquifer, you can call it whatever you want -- is a -- behaves as a single-bearing unit?

A. Single water-bearing unit, yeah. And the reason why we used that is because we look -- when you look at the water elevations between some -- we have a couple of well pairs out there and they're fairly similar, and so -- and I think Mr. Miller's of agreement that that water-bearing zone unit from 20 to 50 seems to be like -- you

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know, there's probably some leakage between it, but the water levels are fairly similar potentiometric surface.

Q. And why do you do a potentiometric map?

A. To try to get the best understanding that we can on the groundwater flow direction.

Q. Of the single water-bearing unit?

A. Correct.

Q. And the single water-bearing unit depth that you're determining is what depths?

A. What's -- the range is --

Q. 20 to 62?

A. Correct. And, you know -- you can look at the individual well construction diagrams that identify where the screens are. They're not all the same depth because you don't encounter the silt zone all at the same depth.

Q. And you're familiar with the publications of Domenico?

A. Yeah.

Q. Show that.

And this is just a publication of the Physical and Chemical Hydrogeology of Domenico --

A. That's a book. Yeah, that's a book.

Q. All right. Even better. Even better.

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Okay. Let's see if we can agree on some more things. The highlighted portion: "In working with these kinds of maps, be aware of these important points. First, a potentiometric map must be related to a single aquifer."

A. Correct.

Q. So if you're going to use a potentiometric map, it's one aquifer; correct?

A. Right. And that's what we've been talking about, the shallow water-bearing zone has a -- if we use the term "aquifer," correct.

Q. Two -- "Second is assume that the flow of the aquifer is horizontal; that is, parallel to upper and lower confining layers," correct?

A. Correct.

Q. And lastly, "The head losses between adjacent pairs of equipotential lines are equal, and the hydraulic gradient varies inversely with distance between lines of equal head."

Did I read that correctly?

A. Correct.

Q. You did a potentiometric map?

A. We did. I think we did a couple of them that are presented in the plan.

Q. Okay.

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A. I think Mr. Miller did as well.

Q. Yeah, I'll show you Miller's.

This is your potentiometric map?

A. Correct. It's one of them, yeah.

Q. One of them. I just want to use it as an example. And as defined by you and Domenico, or the book, this is a potentiometric map of one aquifer?

A. This is our potentiometric map of the water-bearing zone where the wells that were installed were screened in within that range that the previous document was identified at.

Q. Right. So the wells that you're relying upon to draw this potentiometric map are shallow and deeper?

A. Well, they're -- I think you missed -- you may not have heard what I said earlier. When you look at the water levels, they're quite similar. And it seems like both sides are agreeing it's kind of behaving as one water-bearing unit, so that's what we -- how we mapped it here, using this -- tried to incorporate all of the wells.

Q. Okay. Well, then maybe -- maybe we can correct something Mr. Purdom said.

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Then you would agree that the top of the aquifer is hydraulically connected to the bottom of the aquifer?

A. Well, I think that's what I said, is between --

Q. So we agree?

A. -- between the range that we found groundwater, you know, from 30 to 50, there appears to be some connection. It's not a perfect connection because obviously there's, you know, clay, and very -- differences in permeability.

Q. But as a whole, looking at the aquifer, then we could agree that it's hydraulically connected?

A. I believe so. And that's how we've looked at it.

Q. So if I was to pump -- just so I understand. So if I was to put a well at the bottom of the zone and pump the well, eventually I'm going to get water from the top of the zone in some areas?

A. In theory, in some areas. Keep in mind that the variability out there is pretty great from location to location. So yeah, it all depends on where you screen it -- where you screen

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that pumping well.

Q. Correct.

But the water, if I pump it, I'm going to pump down that -- eventually, in some areas, I'm going to pump down that top as well?

A. I think where it's connected. If there are locations that aren't well-connected, it's going to take longer. Correct.

MR. CARMOUCHE: And show figure -- show 7.

BY MR. CARMOUCHE:

Q. This is Greg's. So this is Greg's cross-section diagram.

Do you agree that there is a shell hash, that hatch mark --

MR. CARMOUCHE: If you can zoom in at the top, Scott.

A. I can't answer one way or the other. I'm not sure. It did jump out in the review of the boring logs as laterally continuous or described as shell hash. I'd have to refer the panel to the boring logs to make that evaluation. I just -- I can't tell you as I sit here. It just doesn't jump out at me.

Q. And let's see. I think we can agree on this. Every -- you and Mr. Miller measured head?

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A. We measured water levels; correct, and the monitoring wells out there. We measured it in the pond as well.

Q. And so you would agree that both you and Mr. Miller's measurement of head was pretty consistent throughout the property? The depth?

A. Yeah, I'm trying to remember. And around the water levels, as measured, I don't think there was -- we would -- I can't remember us taking -- Mr. Miller taking a measurement and we'd have two measurements, like you split a soil sample or a groundwater sample. But I think we relied on the same set of data, the measurements that were taken.

Q. Without going through each detail, if the head is consistent at the same depth, so this depth is what? What head is by MW-3? What's that depth?

A. I think that would be representative of the well screen, which is, I think Mr. Miller has used these -- you'd have to ask him, but these black symbols here to represent -- I think that goes with this. But I'm just...

Q. No, that's fine. I'm sorry. Those triangles are indicating head; right?

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A. Right. But I'm just -- I think it goes to MW-3, but it's halfway between 3 and 12, so I'm not 100 percent.

Q. Would you agree with this statement: If you had just silt lenses that were not continuous, you would have head at random depths throughout the sites statistically?

A. Well, we have some variation, but they're fairly close. There is one location I think I heard mentioned the other day, H-10, that had a different one. When you look at that boring log, there's a pretty darn good clay above and below the silt zone. So that one, you may be right in terms of the, you know, difference. But they're generally similar, but there are some differences. And that's not unexpected in a zone like this because you've got variability in grain size within a zone like this as well.

Q. So without me going through each one -- and I'll do that in just a minute -- you would agree with the general statement, concept, just general concept, that if you have -- if you have silt lenses that are not continuous, you would have head at random depths throughout the sites statistically?

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A. If the silt zone was at various depths. But if it's within the same range, you may not be able to decipher it. I think you almost have a hypothetical that if I have a silt zone, for example, at 30 feet and I got one at 100 feet, they're going to be random. But here we have this kind of inter-fingering within a zone, and so it's not a layer cake where you've got one way up here and one way up here, and so...

Q. Let me ask it a different way. If you have silt lenses that are continuous, you would have an equal head depth throughout the site statistically?

A. I would say generally, but you know, they wouldn't be the same because some are going to be different depending on which way the groundwater's flowing. Obviously, there's going to be some gradient, which is the slope of the groundwater table. So they're not going to be exactly the same.

Q. But I'm saying statistically, in general -- it's not going to be the exact same -- but statistically it's going to be equal?

A. If it's a layer cake and everything is the same, then on a hypothetical like that, I'd say yes.

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Q. Mr. Miller interpolated between two points and drew what he considered to be the aquifer. If we showed your cross-sections, you did not do that; correct?

A. We didn't connect some of these, as you can see. If you don't mind, I'll stand up and point out a couple examples.

I think what you're getting at is we didn't put a little lens here and draw it over, because it doesn't exist here (indicating). And so, you know, we didn't extend this out, put dotted lines or dashed lines, because there's so many of them. Could we have done it? Sure. But I think visually when you look at this, what it tells you is -- you can see these, these differences in patterns relative to where it is, relative to the depth.

So it's just -- we're using similar data, I think, although I think our cross-sections -- Mr. Miller's not showing our boring logs, and his don't go as deep. But generally, I think we've pointed out where the silts are, where the clays are. That's what we want to get across.

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Q. And the panel, this is -- your scale might be different than Mr. Miller's; correct?

A. Well, not only the scale, but I think it's important to -- that one that you just showed me, again, Mr. Miller hasn't considered our deeper boring logs in some of those locations. So, and that's a difference, that it doesn't matter on the scale and it doesn't matter whether we drew lines. It's just not there.

Q. Let me ask you this. The depths -- if we can agree.

The depths Mr. Miller interpolated between two points and drew the aquifer, you don't really disagree with at the shallow depth?

A. I didn't analyze each of those, how he interpreted, where he drew. Sometimes I have seen him draw where there are no data. I'll give you an example of the theoretical connection down at the Chicot. There's just no data there, but it's drawn in. So you'd almost have to look at each shape and say: Okay. What data has he used to support that?

Q. Okay. Let's go to -- and you would agree that if you -- let's just show the document.

MR. CARMOUCHE: Next one.

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BY MR. CARMOUCHE:

Q. You would agree that we have pockets of chlorides that decrease in value as you get away from the source?

A. I would agree that there are some locations that have higher concentrations and, you know, this -- I think this example here shows it well with the H-12 and H-9. And it also shows, as you move laterally and quite a short distance, you know, where you have a dramatic decrease in concentrations. But I generally agree with what you're saying.

Q. And you wouldn't have this phenomenon if where you have a source and the chlorides are decreasing its value, if you didn't have a continuous aquifer? This shows that you have a continuous aquifer because it's migrating from one point to another and decreasing with groundwater flow?

A. What it shows you really is that you have a couple different source locations. I think you have the higher chloride in the blowout. H-16, we know, is the salty location. And then we have another one down here. These are three operational areas, so that doesn't mean that this

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is all one big plume that migrated from one particular spot. It's three separate sources. Generally groundwater flows from to the north. So what's going on here is really probably not related to what's going on here.

Q. I'm just saying the groundwater is continuous, meaning the aquifer -- so you have three hot spots, and the chlorides are migrating throughout the aquifer that is continuous throughout this site right here?

A. Well, they have migrated, but I think we have -- in these silt zones, as we showed, they vary in depth and extent, but they're in that same range. So I think what this plot is showing is kind of the data from those monitoring wells.

Q. Right. In one aquifer?

A. In the shallow silt zone; correct. And -- which comprises of these various silt stringers.

Q. And you would agree that the groundwater flows which way by the crater? North?

A. Generally to the north. We can look at the map, but generally to the north, as I remember.

Q. And regarding groundwater, what -- does

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RECAP have a numerical number that you have to have for background for chloride? Are they just --

A. Do they publish a background chloride number?

Q. No, I'm sorry. Do you have to have so many samples or it varies per site?

A. That's a better question for Ms. Levert, but we can look at the language. I can't remember the language, quite honestly.

Q. You would agree that in this shallow aquifer that we're looking at, that not -- on the other side, the groundwater's flowing this way and when we sample the opposite direction for chlorides, we have 156, below 250 drinking water standards; correct?

A. Yes.

Q. We have 57.2?

A. Correct.

Q. We have 62.4?

A. Correct.

MR. CARMOUCHE: And if you'd back out, Scott.

BY MR. CARMOUCHE:

Q. We have one at 221; correct?

A. Yes.

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Q. 239?

A. Yes.

MR. CARMOUCHE: Back out.

BY MR. CARMOUCHE:

Q. And 77.6?

A. Correct. And I think -- you're not showing the -- I think the background wells to the east and to the west that I think -- Mr. Miller used some of that to come up with a background chloride of 428. If you remember, ours was 600-something, so...

Q. And we'll talk to Mr. Miller. But to determine the chlorides in this aquifer to determine if it's usable, there's nothing in RECAP that says you have to go west, go east; this is reliable data that you can rely upon and DEQ has relied upon to determine the background of chlorides in this shallow aquifer?

A. Well, some of these points are very close to source areas and typically you want background locations that are distance from source and operational areas. And so that's why we look at data distant from these.

One thing I'll -- I guess that's what I can point to, is that when you start getting

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inside -- and I've heard Mr. Miller testify on this before. When you start getting inside operational areas, then the background values become questionable or the data becomes more questionable relative to is this really background.

Q. Wouldn't it be -- I think, wouldn't it be more reliable to say if you're not up-gradient of groundwater and away from the source, it would be a good background level because if you're getting 52 and 62 by a source area, that's a pretty good indication that that could be considered as background?

A. Well, I mean, there's a couple points. Again, you're ignoring all of the data set to come to the conclusion of what we came to. And I think Mr. Miller's background calculation came to the same conclusion. His background number on this slide and what he based his remediation on was obviously much higher than these numbers you're pointing me to. So I think there's some agreement there on the background.

Q. You would agree that you took the data from the slug test and determined a geometric mean of each well to determine each well's yield;

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correct?
A. Correct. Well, we took the geometric mean of all of the slug test results, 17 of them.
Q. To determine the yield of each well?
A. Correct.
Q. And then to determine --
A. No, the overall yield of the zone.
Q. That's what I'm going to get to.
You then took the geometric mean of the yield of the wells; correct --
A. No.
Q. -- to determine -- you did not?
A. No. Let's back up.
We do a slug test, we do three slug tests on a well, we'll take an average of those results because, you know, one might be high, one might be lower. So we want to get an average hydraulic conductivity for a well. So we have 17 wells. So three tests per well. I can't remember if we ran three tests for all. We tried. So then we'll have one number which will be an average conductivity for that individual well. We take those 17 average results and take the geometric mean of those 17 to come up with an overall geometric mean of the water-bearing zone. It's

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kind of a two-step process.
Q. Let's step back.
So after you took all the wells from the shallow and the deep of the aquifer, you took the geometric mean of the hydrologic conductivity to determine the average yield of the aquifer?
A. Yeah. What we did is we took the geometric mean of all of the individual well yields; and so -- which incorporates the hydraulic conductivity, which is one of the parameters in the equation, the HC, or the confining head, and the thickness. Now, those vary at every location. And so, to incorporate that variation, then we calculated a geometric mean which would incorporate all that variation. And so that's why we -- that's how we calculated it.
Q. Let me make it a little more simple.
If you had 17 wells and you had three slug tests for each well and you determined then an average yield of each well; correct?
A. Correct. Which is what we did.
Q. Okay. So to determine the yield of the aquifer, did you take -- did you take the yield calculation and do the geometric mean of the yield calculations for each well to come up with your

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opinion of the yield of the aquifer?
A. Yeah, we did. But you can do it both ways because you can calculate a geometric mean of the hydraulic conductivity and then assign geometric mean of the thickness and the HC and come up with a very similar number. So we're talking real subtle differences in calculation. You know, so we've kind of looked at both of those ways, but I encourage the panel to look at that table. It will describe how we made that calculation.
Q. So you would agree -- so you would agree that you did not determine the classification of the aquifer by looking at a well, one well?
A. No. You'd never do that on a site this big with multiple tests. And the use of the geometric mean across a site like this is well-documented, you know, across some big sites that I'm familiar with. You don't just go with one slug test or one aquifer test on a site this large to -- it doesn't adequately represent the variability. So you do one test in a location and we had -- I think the panel saw, we had five locations you don't even have a water-bearing zone. So you can't even do a test.

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How would one test accurately reflect that if you actually did it there? You couldn't do a test. So would you say zero? No, that's not representative. So you evaluate all of them. And that's what we did. And, I think, going back to your question on hydraulic conductivity, I know what RECAP says regarding making that calculation. But like I said, you can make it both ways, and you get basically the same answer. What we did is looked at the distinct difference between some of these locations because that thickness varies as well as the HC, because, as you remember, some of those wells have different screened intervals. We're confident on what we did relative to the result of that calculation.
Q. If you went to a piece of property and you drilled a well, people call for a well all the time in Louisiana. If that person called someone, one of your drillers that you talked about, and they went to drill a well where they thought an aquifer was and that well produced more than 800 gallons per day -- let's say it produced 3,000 gallons per day -- and he measured the TDS and it was less than a thousand, you would not agree that that aquifer where that well is located

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should be classified as a 2?
A. Well, if it meets the RECAP definition for a 2, it yields enough and it meets the TDS concentration.
Q. Then it meets a 2? So we can agree?
A. Correct. But a water well driller wouldn't do that. You know, the ones that we talked to or the one that I talked to for this site, that doesn't really interest them. These zones don't interest them in terms of production of potable water supply.
Q. Okay.
MR. CARMOUCHE: And show this.
BY MR. CARMOUCHE:
Q. So you would agree that Class 2 -- actually, I think it's in every class, Class 1, Class 2, and Class 3 -- the definition says: "Groundwater within an aquifer that could potentially supply drinking water to a domestic water supply."
A. It says "potentially." That's...
Q. To "a."
A. To a domestic -- yeah; right. It doesn't -- that doesn't tell you, when you're analyzing slug tests, what to do with one well. I

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would refer the panel back to Appendix B in RECAP and Appendix F in RECAP to basically, it gives you guidance on, when you have multiple slug tests, how to classify the well. One spot in a 2-square-mile property just doesn't cut it from an aquifer classification standpoint.
A lot of underground storage tank sites use one well, but a site this large, both parties conducted multiple slug tests. You don't ignore all the slug tests. You analyze them all, and you evaluate them all. Not just one. That's not how it works.
Q. You would agree that, just like the hypothetical I just asked you, we went out, Mr. Henning wanted a well on his property, called and said, hey, I want a well. H-9 produced 1,029 gallons per day; correct?
A. That's what the calculation says. Till you put the well in and see what it will do. But that's what the calculation says. And this is hypothetical. A water well driller would actually go to H-9.
Q. That's what you predicted, 1,019 --
A. I understand.
Q. H-18, Mr. Henning, 5700 gallons per day.

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A. Correct.
Q. H-27, 2,013?
A. No. H-27 is 33.
Q. I'm sorry. And that is what depth?
A. You know, the HC is 4 to 6 feet.
Q. Four to 6 six feet.
A. So it's probably a 50-foot -- same zone as a couple of these higher ones that you just pointed out. And so you really see the variability when you start looking at it well by well like that.
Q. Would that be one of the areas that a driller wouldn't put a well in?
A. The one that made 33 gallons?
Q. Right.
A. I wouldn't think anybody would.
Q. Maybe he would move over to H-18 where it was 5700 gallons per day?
A. How would he know that if you just called him up? Typically, when you hire a water well driller, you call him up, say: I want to build my house. I want you to get out and put a well in. What he knows is the Chicot. He doesn't know these shallow water-bearing zones, where they exist. I'm struggling with your original

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hypothetical when you say I'm going to call up a water well driller. A water well driller is not going to see this silt zone, as I mentioned. He's going to go right down to the Chicot because he can put it in at the same price and guarantee the quality and yield.
Q. But I know there's a shallow bearing zone. Maybe I go to you. Maybe I go to Mr. Miller. Maybe I go to Office of Conservation. Maybe I want a shallow well, tell me where I can drill it. So if I drilled it at H-18 and it produced 5700 gallons per day, that's a Class 2 aquifer that I could use as a domestic supply; true?
A. If you drilled it and you've got a water well to drill it and based on that location -- I wouldn't do it. I wouldn't drill it for you and I wouldn't tell a water well to drill it for you. But you could attempt it and, based on the calculation, in theory, it might make that. But you don't -- what you don't -- don't forget: The water you're going to make will be nonpotable water. So it might meet the 5,000-gallon per day.
Q. It might. And I don't want to go through each well, but it could meet the TDS;

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correct?
A. Correct. But again --
Q. It could -- I'm sorry. Go ahead.
A. Well, why did Mr. Miller do five slug tests across the property? Why did we do 12? We didn't just do one. We could have done one, but we didn't. Because we wanted to adequately represent the variability in that zone and tell -- if we wanted to tell a water well driller the variability and the impracticability of drilling a well on that zone. When you look at that, that's when you go deep into the Chicot for a water well. So both parties agree that you need multiple tests; you don't just need one test for a water well.
Q. We're here to determine if an aquifer in Louisiana needs to be cleaned up; correct?
A. That's a different subject; right? We're talking about classification. But if we want to move there, we can talk about that.
Q. Right. There's rules that we have to follow. If it's a Class 2, we have to follow rules or else we won't protect the aquifers. That's the whole reason for the classification. Isn't that true?

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A. There's two things working here: We've got a classification thing working and also the reasonableness and feasibleness of restoring a zone like this to a potable quality. We've got two things working. We have a disagreement, I think, on the classification. I'm not sure that we have a disagreement that this groundwater is pretty poor quality. The question is: Can you remediate it to potable? I believe no. And can you actually remediate it down to these low levels? I don't believe that's feasible either. So we've got two things going on, classification and then remediation.
Q. Maybe not potable. Let's move on if we can agree to disagree.
What about if I dig a pond -- and if you go out to any pond in the state of Louisiana in the summer when you have two months of drought or a month of drought, your pond drops 4 to 5 feet -- and I want a well in water that produces 5200 gallons per day and I want a solar pump because when my level goes down, I want water.
A. Okay.
Q. Okay?
That would be considered under the

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definition of Class 2 as a usable Class 2 aquifer; correct?
A. The water-bearing zone -- let me -- you start talking about a pond and the water level in a pond. Let me --
Q. Go ahead.
A. Are you talking about classification of the pond --
MR. GREGOIRE: Your Honor, I think this a perfect example of the speculative and hypothetical nature of his questions. The witness doesn't even understand it. So I think it's -- if Mr. Carmouche is going to ask questions, he should ask questions related to this specific piece of property and not some hypothetical that does not apply whatsoever to this property.
JUDGE PERRAULT: As to hypotheticals, if he used any in his calculations, ask him about those.
MR. CARMOUCHE: Judge.
JUDGE PERRAULT: Yes, sir.
MR. CARMOUCHE: Then I'm going to have to -- I'll have to come back. Mr. Hennings' going to testify. We've been talking about ponds

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and the use of this groundwater. That's this case. He says it can't be used. I should be able to cross this man to find out. That goes to the classification of the aquifer. It says agricultural supply. It doesn't say -- it says potable, but it also says agricultural supply.
JUDGE PERRAULT: Let me see.
MR. CARMOUCHE: If it can be used...
(Tenders document.)
JUDGE PERRAULT: What would be relevant information?
MR. CARMOUCHE: My point is this, Judge: If the aquifer can be used and it's classified as a 2, which he disagrees with, then the remedial standard changes. He says it's a Groundwater 3. So he disagrees with Mr. Miller, who says it's a Class 2. So all we have to show, if he's wrong -- and I can prove he's wrong and that this is a Class 2 aquifer that could be used for domestic, agricultural purposes -- then there's a standard, that applicable standard that the feasible plan has to meet. That's the requirement of a feasible plan.

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JUDGE PERRAULT: All right.
MR. CARMOUCHE: And he disagrees.
JUDGE PERRAULT: So if he disagrees, what are you trying to get him to do now?
MR. CARMOUCHE: I'm trying to get him to admit that the water, the shallow water aquifer, could be used for agricultural purposes.
JUDGE PERRAULT: Ask him that question.
BY MR. CARMOUCHE:
Q. Do you agree that where the aquifer produces over 800 gallons per day, it can be used for agricultural purposes?
A. As the property is being used for agriculture, large-scale agriculture, no, it can't generate that kind of water. You know, we can use your example of 5,000 gallons a day. That's a few gallons a minute. You can't fill a rice irrigation area. It's just not real practical. And so that's the disagreement we have. It's a substantial disagreement on large-scale agricultural operations.
Q. I don't know if my question said large-scale agriculture.
A. Well --

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Q. I'm sorry. Let me ask you a different question.
You would agree, then, that the aquifer in the shallow zone could be used as a Class 2 aquifer, that produces more than 800 gallons per day, less than a thousand TDS, could be used for -- to maintain a pond's level?
A. You know, it's kind of the same answer because it's just -- it's such a low-yielding zone that a reasonable pond as Mr. Henning's described, the whole west side of the property, that's just not going to cut it either. You're going to evaporate, you know, tens of thousands of gallons of water a day out of a large pond to -- to fill it up. So I just don't -- I don't see it being a real viable option when you have a -- when you've got a well that will make 3500 gallons a minute on the property, to try to engineer some setup to either maintain a level on a pond or try to irrigate these large fields that have been used over the past decades for agriculture. I'm struggling to figure it.
Q. So it's your opinion that the groundwater aquifer that produces 5,000 gallons per day cannot be used to maintain the level of a

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pond?
A. From a practical standpoint, a large pond, I don't think so because you're talking the scale and, you know, again, this is a hypothetical. You hadn't given me a size or dimensions or anything like that, so...
Q. Let's say it takes three days, produces 5 -- that's 15,000 gallons in three days. You're saying that Mr. Henning shouldn't protect that aquifer so he could use it for agricultural purposes in the future?
A. I'm not saying that at all. I'm just saying from a practical and reasonable standpoint that when you have a 3500 GPM Chicot well out here, you sure would want to use that because I'll go back to your original pond example. In a drought condition, when the pond level drops 5 feet, well, guess what, the water level in that shallow zone probably drops 5 feet too because it's getting infiltration. And then you've got a yield problem.
And so that's probably going to limit your theoretical thing, if you've got a real dry pond and you want to turn it on and now your ability of that zone to generate a bigger number

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is not there. So then you'd -- you can't fill your pond up. With all that exercise, why wouldn't you just go from your Chicot well that already exists? That's what I don't understand, I guess.
PANELIST OLIVIER: I do have one question, if could ask. This is Stephen Olivier.
Regarding these couple wells that y'all were talking about, just so I can understand it better, has anybody that you're aware of, Mr. Angle, performed, I guess, more of a long-term test to see if these wells could produce 5700 or 3500 over a longer period of time, if they can withstand that continuous use or is that just maybe like an instantaneous use at one time and then that would be maybe variable over the course of time?
THE WITNESS: Right. Shallow zones like this can be difficult to sustain because of the variation in water levels. You surely don't want -- if you have an extended drought period and the water level drops and you have less water in these shallow zones, they're not obviously as laterally extensive and

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connected as the Chicot Aquifer.
But to get to the heart of your question, no long-term aquifer tests of this zone have been done. Obviously, there's tests of the Chicot Aquifer, but not of this particular zone.
PANELIST OLIVIER: Okay.
PANELIST BROUSSARD: Gavin Broussard. So from that answer, I guess I have a follow-up question: So all the numbers, the rates we're talking about today were calculated based off of a slug test; correct? Everything in these plans that we've looked at, both plans, were calculated based off of a slug test?
THE WITNESS: That's correct. So from the tables in our -- the slug test table; correct. That's correct.
JUDGE PERRAULT: Please proceed, Counsel.
BY MR. CARMOUCHE:
Q. So to follow up on that, you have used slug tests on this site to classify an aquifer and determine if remediation needs to be done and it was accepted by DEQ? The method --
A. On this property?

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Q. No. I'm sorry. The methodology -- I'm talking about methodology. I think that's where we're getting --
The methodology you used here, and so did Mr. Miller, that is an acceptable methodology by DEQ to determine the yield and the classification to determine if remediation needs to be done?
A. Are you talking slug tests in particular?
Q. The tests that y'all performed --
A. Yes, slug tests are a recognized way to gather hydraulic conductivity data to classify water-bearing zones.
Q. And that has been accepted by DEQ?
A. It hadn't been presented on this property.
Q. No, I'm talking about methodology.
A. Other sites in the state, sure.
Q. Okay. Following up on what Mr. Olivier asked you: There are ways to determine the sustainability of the aquifer; correct?
A. At a longer-term, yeah, pumping, yeah, you could -- yes, there are.
Q. There are ways that you can do

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sustainability tests; correct?
A. Correct, longer-term tests.
Q. And that's something you didn't do?
A. Neither party did. Neither party did. We did slug tests -- and the reason why slug tests are widely used, across the state really, they -- you can do more of them and evaluate differences in locations and variations. And so that's why both parties -- I think Mr. Miller did five, we did 12. And that's pretty common across the state.
Q. And, but just for you, you didn't do any type of sustainability analysis?
A. No, I didn't -- I didn't feel like I needed to with the information that we had.
Q. Almost finished.
Your contingency for land on groundwater that you -- go ahead.
A. Yeah. I apologize.
I didn't mean to interrupt you. Just something hit me. Sustainability analysis, I would say we did. And here's why. Because when we try to sample wells and purge them and get samples out of them, they go dry. So that's actually a sustainability test of an individual

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location. Now, wells that don't go dry, obviously, you can't tell anything. But we had five examples where the well would actually go dry, and that's a short-term test and that tells you a lot. Because we're pumping water out for -- and we can -- you can look in the field notes and see how long we're pumping for. It's not very long. In some cases, a few minutes, the well goes dry. So what that is, is a direct demonstration of the lack of sustainability in some locations out there. So we know the answer to that question -- and I apologize for not thinking about that earlier. So that's an important piece of information that has been done.
Q. Okay.
A. And I'm sorry.
PANELIST OLIVIER: This is Stephen Olivier again. Just to make sure I understand just for clarity, so what you were saying by some wells pumping dry and not being able to purge, that gives you indication on the sustainability of the area as a whole?
THE WITNESS: Correct. And so if you can imagine, we put this tubing down these wells and you start pumping water out to get a

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representative sample and then the well literally goes dry. And then you have to stop pumping, allow it to recharge to continue your process to ultimately get your samples. And so that's a direct measurement of the sustainability of those locations that went dry. There are six of those on that one figure. And I encourage you guys to look at that. So those are direct measurements of the sustainability at those locations.

BY MR. CARMOUCHE:

Q. And before I get to the costs -- and that will be the last question -- is again, you didn't do an analysis outside the mile to determine if throughout Calcasieu, Cameron, all these parishes, that they do have wells in shallow aquifers that have produced this amount of water with high TDS and they use it for cattle troughs and to maintain pond levels?

A. Yeah, it's kind of irrelevant relative to the location of the site, the distance from the property. You know, the 1-mile radius, it's not real relevant. So...

Neither side did it, but it's not real relevant because you've got to look locally to

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understand. I think the variability is well-documented in the cross-sections. Looking somewhere 5 or 10 miles away is not going to tell you much.

Q. It wouldn't be unreasonable for it to be relevant to Mr. Henning, who -- if he wants to use this shallow aquifer, it would be relevant, if it has 39,000 parts per million of chlorides, that would be relevant to him?

A. If, hypothetically, he had actually used it, I would say it would be relevant if he used it. But he's not.

Q. Okay.

A. And he's got a well in the Chicot that's already there.

Q. Let's go to the cost and we'll finish up.

Your groundwater contingency plan assumes that you can pump and treat the shallow water and then directly inject it into a saltwater disposal well?

A. Yeah, there wouldn't be any treatment involved. I think it would be an injection, as I remember, into an SWD. This is hypothetically calculated.

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Q. Well, to support that, you gave the panel a record communication in 2014 of Peak Energy. Do you remember that? I'll show it to you.

A. Yeah, I do. It's a communication on trying to assign a cost to put in an SWD, if, hypothetically, that you actually needed one.

Q. Because if you just take the aquifer water out, you have to blend it with produced water or some other type of water to get it to go down a saltwater disposal well?

A. Well, if you ever got to that stage, you'd have to look at it. You'd definitely have to look it.

Q. And I'm talking about the cost.

A. But I -- going back to -- thinking back, I think Mr. Kennedy, in his report, early on in production, was generating freshwater out here. And so you'd have to look at all of that. I mean, to get to the -- to try to better answer that question.

Q. Can we agree there's no production out here today?

A. Not today, yeah, that's correct.

Q. So if --

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A. I think there's one well that's still out there, but there's no production as far as I know.

Q. And the document to support what you talked about, they were -- there was actually production by Peak, and they were going to blend the produced water with the aquifer water to inject it down the saltwater disposal well?

A. I think -- I don't know. I'd have to look at it. I can't remember. We were primarily trying to figure out, you know, what kind of costs can we assign to install an SWD hypothetically. We didn't go to the extent or involve Mr. Kennedy in converting an existing well to an SWD, which would be possible. So we didn't engineer it that far down because we think it's a quite hypothetical situation.

Q. And I'm just talking about the difference in cost. It says: "Conversation of well to saltwater disposal well and Peak's capacity to accept volume of recovery groundwater," is what it says.

A. I see it.

Q. And if you go down here, it says: "Convey to tank, pump out and meter with salt

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water to blend into saltwater disposal well."
A. Correct, that's what it says.
MR. CARMOUCHE: That's all the questions I have, Your Honor. Thank you.
JUDGE PERRAULT: Any redirect?
REDIRECT EXAMINATION
BY MR. GREGOIRE:
Q. So, Mr. Angle, Mr. Carmouche asked you several questions about hydraulic conductivity toward the end of his questions; do you recall that?
A. Yes.
Q. So I want to first start with the actual rules and regulations that applied to that determination. And we talked about it earlier, but I think it bears worth mentioning again.
MR. GREGOIRE: So, Jonah, if you can put up Slide 27 from Mr. Angle's presentation.
BY MR. GREGOIRE:
Q. So remember, we talked about this earlier. This is from RECAP Appendices B and F; is that right?
A. Yes.
Q. And this is what guides you or what guided you and your colleagues in determining

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hydraulic conductivity in arriving at maximum sustainable yield at this property; is that right?
A. Correct.
Q. So explain to the panel members the process, what the rule says again, and how you applied that rule embedded in RECAP in the field.
A. Okay. Go to Appendix B here, "Site investigation requirements." That tells us what to do in the field. Conduct an adequate number -- or "Slug tests shall be conducted on an adequate number of monitoring wells." That's what we did. We tested 12. ICON tested 5.
The second part, "When averaging a number of hydraulic conductivity results, geometric means shall be used." We had obviously 17 results. I told you we took the geometric mean of the yields. You could do it reverse, do it with the conductivity, very similar answer. So we followed Appendix B in RECAP and then followed up by Appendix F, which I think both of them recognized that multiple tests make sense across large properties. That's what -- that's what we did.
Q. So this is not you, Mr. Angle, speaking and making that determination, but you're guided

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by RECAP, the actual provisions; is that right?
A. Correct.
Q. And you're confident that you applied RECAP Appendix B and F in your determination of maximum sustainable yield; is that right?
A. Yes.
Q. And you arrived at a calculation of, what, 396 gallons per day?
A. Yeah, 398, right below 400.
Q. And that's below the 800-gallon-per-day yield that's embedded in RECAP; is that right?
A. It's a little less than half.
MR. GREGOIRE: So, Jonah, let's move to Slide No. 21.
BY MR. GREGOIRE:
Q. Remember Mr. Carmouche asked you about this chart.
MR. GREGOIRE: If I might approach?
JUDGE PERRAULT: Yes.
BY MR. GREGOIRE:
Q. This is a summary of the LDNR MFPs. You've read all of these; right?
A. Yes.
Q. And out of all of these, the only ones in which you did not work or testify were which

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ones?
A. Savoie, Agri-South and Sweet Lake.
Q. And we're going to talk about Agri-South in a second. So I think Mr. Carmouche inferred that only limited admissions would apply to this proceeding? Do you remember that question?
A. Well, yeah, it was talk of -- what I remember is, you know, a limited admission was filed in all of these.
Q. And there are -- Act 312 has been in effect since, what, 2006; right?
A. Correct.
Q. You're aware of that?
A. Yes.
Q. And there are two ways that this proceeding is referred, or might -- every Act 312 case is referred to this panel, this agency; right, in your understanding?
A. Yes, that's my understanding.
Q. You either admit responsibility or the jury makes that determination; right?
A. Correct. And I've been through both processes with a jury trial and a subsequent hearing.
Q. Are the rules and regulations that this

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panel has applied any different regardless of whether it's a limited admission or not?
A. No, no. Really, it's immaterial relative to our evaluation of the data from 29-B or RECAP.
Q. And were each of these matters matters where LDNR issued a most feasible plan under Act 312?
A. It's my understanding.
Q. Okay. So I want to talk next about Agri-South, and you did not testify in Agri-South, but you've reviewed it and you tried to testify about your understanding. And so what is your understanding, first of all, about Agri-South and what that matter involved as is related to the root zone, an effective root zone analysis?
A. Competing root zones, the panel, I think, at the time heard two different experts on the root zone, came to a determination of a depth of 8 feet. But I think it was a site-specific analysis by both parties, but secondarily it was this: what do you do about salt below the root zone, you know, at that point, at 8 feet? And I don't know that has all resolved yet, but I do know a root zone was used, was applied.

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Q. Do you know whether rice was harvested at the Agri-South property? Was that the main --
A. No, I don't think that I talked anything about rice. It was different crops. It was completely different crops than we've been talking about.
Q. Different part of the state, wasn't it?
A. Yeah, it was.
Q. Catahoula Parish?
A. Right.
Q. And this case is pending where? Jefferson Davis Parish?
A. Yeah.
Q. Okay.
MR. GREGOIRE: So what I'd like you to do, Jonah, is I want you to turn to Exhibit 39, page 3.
And I want you to blow up the first paragraph. If you don't mind. Yeah.
BY MR. GREGOIRE:
Q. So as you said, there were two competing root zone analyses in that case; right?
A. Correct.
Q. One was from the responsible party, Tensas Delta, and one was on behalf of Agri-South,

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the landowner; right?
A. Correct.
Q. Okay. So but what was equally important was this: Was it your understanding that LDNR required remediation in this order?
A. Boy.
Q. We'll get there.
A. Yeah.
Q. It says here: "Testimony from an Agri-South expert, Dr. Provin, as well as the Tensas Delta expert, Mr. Daigle, clearly established that excavating soils that exceed the Chapter 3 salt parameter criteria to the full depth of noncompliance at the Plug Road property is not necessary or desirable to restore the soil resources at the site." Am I reading that correctly?
A. Yes.
Q. Further said, "Further testimony from both Tensas and Agri-South, soil science experts both for Agri-South and for Tensas, indicated that soil remediation activities should minimize to the extent possible any disturbance of the natural soil profile or continuum"; is that right?
A. Correct.

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Q. And so that was an opinion offered by both agronomists and soil scientists in that case; correct?
A. Correct.
Q. Did the landowner's expert propose soil excavation?
A. Yes -- or no. Yes.
Q. Not according to this; right?
A. No. I apologize. No. I mean, they identified an 8-foot root zone. When you get below that -- I'm sorry, I'm getting tired -- when you get below that, they basically say: You don't want to disturb that soil continuum. If you listen to Dr. Ritchie and for those of you who have had the opportunity to listen to Dr. Holloway, when you remove soil and try to replace it, no matter how well you do it, it doesn't come back that way. Because that soil profile takes hundreds, if not thousands, of years. So I think these two experts are pointing to that sensitivity.
Q. So let's move -- and we'll segue off of this, but I want to actually go to the plan. And let's go to page 4 under "Plan."
MR. GREGOIRE: It's the middle of the page,

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Jonah, first paragraph. I want you to blow that up.
BY MR. GREGOIRE:
Q. So this is the agency, this is the panel speaking from the most feasible plan; is that right?
A. Yes.
Q. "Therefore, in accordance with Chapter 3, Section 313 B, should Tensas Delta choose to pursue their proposed plan summarized above, Tensas Delta must develop and submit to the agency a work plan to implement a site-specific soil treatability study to determine the effectiveness of and best treatment strategy for reducing the EC levels of 4 millimhos or less with use of soil amendments in the soil throughout the vertical and horizontal soil profiles at the impacted areas at the Plug Road property to a depth of 8 feet." Was there a requirement in that section that the soil be excavated to 8 feet?
A. No, it was a treatment amended remedy like we had talked about at those three locations on this property. That's kind of the same remedy.
Q. And while we're on issues of soil and whether it should be excavated or not, you were

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asked questions about two sites and pit remediations that occurred there. Let's first start with East White Lake. You're very familiar with that project; right?
A. I've been working on it since 2006. Pleasant opportunity.
Q. So Mr. Carmouche asked you about pit remediation at that property; is that right?
A. Um.
Q. At the beginning of the presentation?
A. I think so. It's been a long time.
Q. What was the constituent of concern at that pit?
A. Oil and grease.
Q. Oil and grease. So as a result of that, you had to excavate -- as you said earlier, if there's oil and grease exceedances, 29-B exceedances, located at depth, you have to address it; right?
A. At any depth and we had an exceedance of 1 percent. So obviously that's what we did. We don't have any oil and grease exceedances at this site.
Q. None. None here; right?
A. Uh-uh.

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Q. The other photo that he showed you was one from the Martin Fleming case; do you remember that?
A. Correct.
Q. The big trench?
A. He didn't mention the case, but I'm pretty sure after I saw the pictures.
Q. It's the Martin Fleming. I can assure you. So that was something that you and your colleagues worked on, or your colleagues did, in connection with the soil excavation?
A. Pit closure.
Q. Yeah, it was a pit closure.
A. Correct.
Q. And in that pit closure, the substance of concern, constituent of concern, again, was oil and grease, wasn't it?
A. Yeah, I think so. I'd have to go back and look at the data. I can't -- oil and grease was one. I can't remember.
Q. But if there's an oil and grease exceedance, as you said, in the soil, then you treat it differently than you might treat chlorides in the soil?
A. Yeah, metals and oil and grease, you go

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to any depth when you're doing a pit closure, and that's well-documented in pretty much all of the work we've done relative to the pit closures that I've done: We go to any depth there. We treat the salt parameters as agronomic parameters.
Q. I want to talk a little bit about the Hero Lands reference where you were asked a question about a determination that was made by the Office of Conservation about the quality of the water. Do you remember that?
A. Yes, sir.
Q. And you're personally involved in the Hero Lands most feasible plan; is that right?
A. Yes.
Q. And you tried to explain the -- that it wasn't a matter of the natural quality of the water that was at play but it was other circumstances which drove the Office of Conservation's further investigation. Do you remember that?
A. Yeah. I think so. But keep going. I think so.
Q. So the natural quality of the water was at play; is that right?
A. It was. I mean, it -- again, very

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shallow zone, as I remember, down there. And natural quality is naturally saline, and it's starting to come to me now.

So yeah, water quality, shallow zone, similar issues.

MR. GREGOIRE: If we can, Jonah -- and we won't last much longer -- if we can move to Slide 33.

BY MR. GREGOIRE:

Q. And you explained earlier the natural variability of the silt stringers out at this property?

A. Yes.

Q. And this is a cross-section that gives you an example, actually 33 and 34, if you want to move each one. This is E and E prime and if you want to move to the next slide we can, as well. But does this describe to you the issue of how you have the various silt stringers which are not naturally, naturally at the same level throughout this property?

A. Yeah. And I think the previous -- if you don't mind going back to the previous. This one, that's loud and clear that water well drillers don't even see those silt stringers, and

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I think that's telling. The second one, if we go to the second one, we see those because we're taking these scientific 2-inch cores continuously and looking at them and really looking for them. And so on this one, you can see them. Water well drillers, quite honestly, they don't care. They go right through them because they know where they need to end up.

Q. And you were asked a question about the use of the property, several questions about the use of the property. And if you recall, one of those questions related to Section 2.9.2 of RECAP, which defines nonindustrial uses of the property. Do you remember that?

A. Yes.

Q. Is that a section that you recall Dr. Levert and Dr. Kind specifically relied upon in arriving at their human health risk assessment and toxicological evaluation?

A. I'm pretty sure. They rely on the whole book. Especially Ms. Levert. She knows the book and she relies on it.

Q. And she relied upon it, because I think one of the first things she said in her testimony is that she analyzed this property from a

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residential nonindustrial standpoint under RECAP's rules and regulations; is that right?

A. She did and I definitely heard that.

Q. And lastly, Mr. Angle, I just want to make sure we're clear on the record that your evaluation in this case, it didn't involve interpretation of legal rulings; is that right?

A. No.

Q. Did it really involve --

A. No.

Q. You're a scientific scientist, aren't you?

A. Right, right.

Q. You're here to interpret the rules and regulations as it relates to the data set; is that right?

A. Correct. The rule that the -- the published standards, we work within those, comparing the data we gather to 29-B and RECAP standards.

Q. Would you want to compromise your technical and scientific expertise that you've applied in numerous cases in order just to drive a certain result, Mr. Angle?

A. No.

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Q. But in order to comply with the judge's ruling, you offered alternatives, did you not, to this panel for remediation of the soil, didn't you?

A. We did, and we also offered a hypothetical plan, which is a, you know, an addition to our main plan to basically try to meet those requirements, the judge as well as the Act 312, Chapter 6.

Q. And the hypothetical plan was just a plan that you offered because of the requirements of 29-B; is that right?

A. Yes. We want to try to be compliant with that requirement.

Q. Doesn't necessarily mean that that hypothetical plan is the most feasible and most reasonable; is that right?

A. That's correct. That's where the science comes in in our multidisciplinary team. That's where we come in.

Q. Thank you. That's all I have.

JUDGE PERRAULT: You've talked about Exhibit 39. Are you intending to offer that into evidence?

MR. GREGOIRE: I am. Actually, it's already

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in.
JUDGE PERRAULT: It's already in?
MR. GREGOIRE: Yeah, it's already in.
JUDGE PERRAULT: Oh, there it is. Is there an objection to Exhibits 32 through 39 and Exhibit 47?
MR. CARMOUCHE: No, Your Honor.
JUDGE PERRAULT: No objection. So those shall be admitted.
Does the panel have any questions of this witness?
PANELIST OLIVIER: Could we take a ten-minute break?
JUDGE PERRAULT: We'll take a ten-minute break and we'll go off the record.
(Recess taken at 3:55 p.m. Back on record at 4:17 p.m.)
JUDGE PERRAULT: Going back on the record. We've had a short break. We're back on the record. Today's date is February 8th, 2023. It's now 4:17 and the panel has -- does the panel have questions for this witness, Mr. Angle?
PANELIST DELMAR: Yes, Your Honor, we do.
JUDGE PERRAULT: Please state your name,

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whoever's asking, and go forward.
PANELIST DELMAR: I think a couple of us will actually have questions. I'm Chris Delmar. One of my questions actually is about the chloride background calculation that you did.
I know you said that you used a statistical analysis of the area. Did you pick out specific points, like discrete points to use, or was it sort of like -- did you pick out -- which discrete point did you pick to come up with that?
THE WITNESS: Yes. We -- in Appendix T, we provide all of the data that we used in the ProUCL statistical calculation. So we identify the well and the chloride concentration.
PANELIST DELMAR: Okay.
THE WITNESS: Yeah, so the individual data points are laid out as well as the statistical calculation. It's attached as Exhibit 2, I believe, to Appendix T.
PANELIST DELMAR: And I guess another question I had, too, is also related to sort of that -- remember there was this one well that had a considerably lower water level

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compared to the wells around it. It was like 5 feet below land surface.
THE WITNESS: H-10.
PANELIST DELMAR: H-10, yeah. Are you familiar with the Wilcox aquifer in northwest Louisiana?
THE WITNESS: Yes.
PANELIST DELMAR: In sort of like a lenticular?
THE WITNESS: Right.
PANELIST DELMAR: Is it possible that we have something similar -- on a smaller scale, obviously -- but something similar on the property here where we have these sort of lenticular water-bearing zones as where they're not necessarily interconnected but kind of like -- you said like fingers or something like that where, if you go 10 feet to one side, it's not there but you go 10 feet to the other side, there's a lot of water?
THE WITNESS: Right. No, I'm familiar with Wilcox. Yeah, that's a good analogy, I think. Obviously, North Louisiana, Wilcox, those lenses tend to be more sand. But

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you're right in the general kind of description. And I think, going back to your first one, the H-10, when you do look at the boring log -- and I went back and looked at it the other day -- and it appears it's just -- it's not well-connected to the rest of them, like the rest of them are when you look at the water levels. But that water -- that boring log has really good clay above and below and a fairly small water-bearing zone, so...
PANELIST DELMAR: I have one last question. It is about kind of more of a remedial approach to pump and treat. Would subsidence be a concern if you were to sort of try to pump out these wells of water? Would you have to deal with anything like a hole collapse or really just land surface drop?
THE WITNESS: Yes, that's a very good question. And the answer is when you remove water from aquifers, they can subside. Unfortunately, the City of Houston has some places, southeast side by Hobby Airport and maybe farther south, that subsided up to 2 feet. And I know where I live, there's

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been a mandate -- we used to be on groundwater in Chicot. I'm a Chicot guy. My subdivision's a Chicot-supplied water source.
But over the past few years, there's been mandates by the subsidence districts to reduce pumping on the Chicot and go, you know, some percentage from surface water to directly address that instance that -- the subsidence that's happened around the Houston area. It's definitely a possibility. We really haven't technically fully evaluated that, but it is a possibility.
And in terms a long-term pumping scenario -- and I can think of where it could be more influential, would be in those periods of drought where you're really pulling pretty much as much water out of that zone as possible, kind of drying it out, and then you take away that pore pressure and then that could happen.
PANELIST DELMAR: So you'd say the subsidence is more of a long-term issue, not an acute problem that would occur --
THE WITNESS: Correct. And I think it would manifest itself over time. And it might be

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incremental over time if one were to take surface land measurements, you know, ground surface elevations, and look at the trend of that over time.
PANELIST DELMAR: Okay.
PANELIST OLIVIER: This is Stephen Olivier. One more question we have. This is going back to ICON's comments to ERM's MFP. And one question or comment they had that I did want to get clarification on is: With everything considered, would it be of your opinion, could the landowner grow crops with a deeper rooting depth other than what is currently being -- or what has currently been used on the property? Would the property be able to effectively, you know, maintain a healthy growth of crops with something with a little bit of a deeper rooting depth?
THE WITNESS: Yeah, that's a good question. Unfortunately, I wish Mr. Ritchie was sitting beside me, but I'm going to try my best. Obviously, they define, Mr. Ritchie defined a 1-foot zone. As you remember, I pointed out the only -- there's three locations that we go down to 3 feet, and that's just SAR and

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ESP, although I think Mr. Ritchie's and Dr. Holloway's opinion has always been -- and we've seen this -- that those exceedances don't affect growth as much as EC. We don't have elevated ECs at those depths.
And so my answer would be it feels like that that shouldn't be a big hinderance at those locations and I think -- probably as a backstop at those particular locations. That's why we talked about that amending remedy down to a depth of 3 feet between, you know, 1 -- between Mr. Ritchie's root zone and the 3-foot depth.
PANELIST OLIVIER: It sounds like, in your opinion, because we're just not seeing any exceedances in EC levels in that first 3 feet, would you say it would be potentially -- or would you say it would be supportive for other crops with a deeper rooting depth than that first 3-foot --
THE WITNESS: It seems like it because we just don't see those high EC levels at the surface out there, which is, you know, it's a good thing.
PANELIST OLIVIER: Okay. All right. Thank

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you. And that's all the questions that we have for the panel.
JUDGE PERRAULT: All right.
THE WITNESS: Thank you for your attention, everybody.
JUDGE PERRAULT: Thank you. And that concludes the testimony of Mr. Angle. We're going to adjourn.
Tomorrow morning at 9:00 o'clock -- is Chevron's case over?
MR. GREGOIRE: It is, Your Honor.
JUDGE PERRAULT: So tomorrow, Henning will begin their case. If there's nothing further, we're adjourned until tomorrow morning at 9:00 o'clock.
(Hearing adjourned at 4:25 p.m.)

REPORTER'S PAGE

I, DIXIE VAUGHAN, Certified Court Reporter in and for the State of Louisiana, (CCR #28009), as defined in Rule 28 of the Federal Rules of Civil Procedure and/or Article 1434(B) of the Louisiana Code of Civil Procedure, do hereby state on the Record:

That due to the interaction in the spontaneous discourse of this proceeding, dashes (--) have been used to indicate pauses, changes in thought, and/or talkovers; that same is the proper method for a Court Reporter's transcription of proceeding, and that the dashes (--) do not indicate that words or phrases have been left out of this transcript;

That any spelling of words and/or names which could not be verified through reference material have been denoted with the phrase "(phonetic)";

That (sic) denotes when a witness stated word(s) that appears odd or erroneous to show that the word is quoted exactly as it stands.

DIXIE VAUGHAN, CCR

R E P O R T E R ' S C E R T I F I C A T E

I, Dixie Vaughan, Certified Court Reporter (Certificate #28009) in and for the State of Louisiana, as the officer before whom this testimony was taken, do hereby certify that on Wednesday, February 8, 2023, in the above-entitled and numbered cause, the PROCEEDINGS, after having been duly sworn by me upon authority of R.S. 37:2554, did testify as hereinbefore set forth in the foregoing 273 pages;

That this testimony was reported by me in stenographic shorthand, was prepared and transcribed by me or under my personal direction and supervision, and is a true and correct transcript to the best of my ability and understanding;

That the transcript has been prepared in compliance with transcript format guidelines required by statute or by rules of the board;

That I have acted in compliance with the prohibition on contractual relationships, as defined by Louisiana Code of Civil Procedure Article 1434 and in rules and advisory opinions of the board;

That I am not of Counsel, nor related to any person participating in this cause, and am in no way interested in the outcome of this event.

SIGNED THIS THE 24TH DAY OF FEBRUARY, 2023.

DIXIE VAUGHAN
Certified Court Reporter (LA)
Certified LiveNote? Reporter