DNR HEARING - HENNING MGMT. VS. CHEVRON DAY 1

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 Monday, February 6, 2023
DAY 1
(pages 1 through 244)

Held at the DIVISION OF ADMINISTRATIVE LAW
COURTROOM 1
1020 Florida Street
Baton Rouge, Louisiana

REPORTED BY: DIXIE B. VAUGHAN, CCR

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(PROCEEDINGS COMMENCING AT 9:02 A.M.)
JUDGE PERRAULT: We're on the record. Today's date is February 6th, 2023. We're in Baton Rouge, conducting a hearing for the Case Docket No. 2022-6003-DNR-LLC in the matter of Henning Management LLC versus Chevron USA Incorporated. This case has been remanded to the Department of Natural Resources by US District Court Western District of Louisiana Judge James Cain for the development of the most feasible plan in accordance with Louisiana Revised Statute Title 30, Section 29. I'd like the parties to make their appearance on the record and we'll start with Chevron.
MR. GREGOIRE: Good morning, Your Honor, panel members. Victor Gregoire on behalf of Chevron USA.
MR. GROSSMAN: Good morning. Louis Grossman on behalf of Chevron USA.
MS. RENFROE: Good morning, Your Honor and panel members. Tracie Renfroe also on behalf of Chevron USA.
MR. CARTER: Good morning. Johnny Carter, also on behalf of Chevron USA.

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MR. BRYANT: Good morning. Mitchell Bryant on behalf of Chevron USA.
JUDGE PERRAULT: All right. And for Henning Management.
MR. CARMOUCHE: Good morning. John Carmouche on behalf of Henning Management.
MR. WIMBERLEY: Good morning. Todd Wimberley on behalf of Henning Management.
MR. KEATING: Good morning. Matt Keating on behalf of Henning Management LLC.
JUDGE PERRAULT: And like the panel of experts who are going to hear the case to make their appearance on the record. And we'll start here. Just give your name, your agency, and your area of expertise, please.
PANELIST LITTLETON: Jessica Littleton, petroleum scientist with the environmental division of the Department of Natural Resources.
PANELIST DELMAR: Chris Delmar, petroleum scientist supervisor. I'm a geologist with the environmental division of the Department of Natural Resources.
PANELIST OLIVIER: Stephen Olivier, petroleum scientist manager with the Office of

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Conservation, environmental division.
PANELIST BROUSSARD: Gavin Broussard, petroleum scientist manager with the Office of Conservation, engineering division.
JUDGE PERRAULT: Thank you.
And Mr. Olivier, you're the panel coordinator; is that correct?
PANELIST OLIVIER: Yes, sir.
JUDGE PERRAULT: Do we have any questions before we begin? If not, any motions questions, then I'll ask Chevron to present their case.
MR. GREGOIRE: Good morning, Your Honor, panel members. I'd like to present a brief opening statement.
JUDGE PERRAULT: That's fine.
MR. GREGOIRE: If it pleases the panel.
Judge Perrault, LDNR panel members, as I mentioned earlier, I'm Victor Gregoire. I represent Chevron USA along with my colleagues Tracie Renfroe, Lou Grossman, Johnny Carter, and Mitchell Bryant. It's a pleasure to be here before you today for this administrative hearing. We thank you for giving Chevron the opportunity to present a

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plan to address the environmental media and constituents at the Henning property.

We know that your job is a challenging one, yet it's a very significant one in that competing most feasible plans have been submitted by both parties; that is, Chevron and the landowner, Henning Management. And you have been tasked by the Louisiana legislature and presiding court to review the sampling data and to provide your technical expertise in arriving at a most feasible plan to address environmental constituents at the property, particularly in the soil and groundwater.

We are here, as you know, because the Louisiana legislature adopted a procedure that we all know is commonly referred to as Act 312. It allows an oil and gas company to admit responsibility for environmental damage, which is defined as actual or potential impact under the statute at oil field properties which are under the jurisdiction of the Office of Conservation. Chevron admitted potential impact to environmental media. It filed a limited

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admission as to discrete areas of soil and groundwater in this property. So this issue has been referred to you for adjudication and to arrive at a most feasible plan for the property.

The legislature has delegated to you, the Office of Conservation, as the regulatory body with the technical expertise to review the sampling data and to apply, more importantly, applicable regulations to arrive at a most feasible plan for the property that is protective of human health and the environment.

There should be no dispute, as you will see in the testimony today and this week, what the applicable regulations are; namely, 29-B and RECAP. And panelists before you have applied those very regulations in arriving at a most feasible plan for the property.

Those panels have included Office of Conservation panels in the East White Lake matter, Poppadoc, Hero Lands, Louisiana Wetlands, and Newman, to name a few. We ask that you panel members arrive at a most

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feasible plan in this case after hearing the testimony and evidence submitted within the next couple of weeks that is commensurate and consistent with the methodology that this agency has applied on numerous occasions, including under the most feasible plans that I mentioned to you earlier.

We are aware of Judge Cain's ruling in this case, and we're not here to argue about that ruling or its scope. The ruling is there, and I'm sure you have reviewed it and know what the ruling provides. That ruling is the subject of legal filings in the federal court proceeding. But as I mentioned to you, we ask that you, the panel, use your technical expertise and your knowledge of the applicable regulations to arrive at that plan that is the most feasible, which is defined in statute as the most reasonable -- and that's important: The most reasonable -- to protect human health and the environment. We just ask for consistency in approach in your methodology that you've used in prior Act 312 proceedings and most feasible plans.

Chevron's experts, as you are aware,

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have provided you with a most feasible plan that addresses the soil and groundwater at this property. And those experts have arrived at conclusions as to what the proposed feasible plan, which is the most reasonable plan, should be by implementing the very methodology, the same or similar methodology that some of you panel members and other panel members have used and arrived at in prior most feasible plans.

And at the end of the day, you're going to hear testimony from the experts from both sides. But Chevron's experts will show to you, through numerous disciplines, starting with geology, hydrogeology, ecology and ecological risk assessment, human health risk assessors, radiological assessors, that the constituents found at this property, including the soil and groundwater, pose no threat or risk to human health and the environment. That's the very -- that's the very responsibility that you have as delegated by the Louisiana legislature as codified in Act 312: To arrive at a plan which is protective, which is protective and

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most reasonable in protecting the human health, public safety, and environment.

We will present those witnesses to you throughout the week; and the plaintiff, the landowner, will submit its witnesses to you as well. We encourage you to ask questions as we present our witnesses and the testimony that they have.

We thank you again for your time and we look forward to working with you this week and next.

JUDGE PERRAULT: Would Henning like to make an opening statement?

MR. CARMOUCHE: Good morning. John Carmouche on behalf of Henning Management. I'll try to be a little less formal and just talk to you as scientists.

Unfortunately, we're here to apply rules. And there were rules that were set by the legislature, 2006 and on. And that is what -- those rules is what you have to follow today. And the judge in this case has told us what those rules are. We have, as lawyers and as Chevron, agreed to an EMO, which do not -- you weren't a part of. We

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agreed with the judge, a federal judge in Lake Charles, that we would take time and spend the money to sample this property, soil and groundwater, for months, spend hundreds and hundreds of thousands of dollars on sampling and then, at that point, when everybody knew what the data said and if you need more time to actually know what's on the property, soil and groundwater, then ask for more time to sample so when we got here, you would know what is on the property. There should be no question. That's what they agreed to.

So we did all of the sampling. We didn't choose. You didn't choose to be here. They chose to be here today. They chose under the statute to admit that the property was contaminated, is contaminated, and that there is environmental damage. And when they did that, there was consequences because the rules we have to follow tell us what they need to follow. They need to follow the rules.

Can you put it up, please?

This is what they admitted.

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Contamination. This is what you have to follow as to what they admitted this property is. "The introduction of substances or contaminants into a useable groundwater aquifer, an underground source of drinking water."

Okay. So the first thing they admit is that there's presence of substances or contaminants in the drinking water aquifer. It doesn't say that I'm admitting introduction or presence of substance or contaminants into a nonusable aquifer. It doesn't say that. It doesn't say that the water can't be used. It says: I, Chevron, am admitting that there are contaminants in a drinking water aquifer.

"Or soil in such quantities as to render them unsuitable for their reasonable intended purposes." So they recognize and admit to you that there are substances and contaminants and that the soil is unsuitable for its intended use. That's what they admitted, and that's what you have to assume today because that's what they admitted to you and to the judge.

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Environmental damage. Mr. Gregoire went over it. He just left out a little part: "Shall mean any actual or potential damage or injury to environmental media caused by contamination."

So first we start with contamination, and then you can have potential impact from that contamination. But first, it has to be caused by contamination and then you go back to the definition of "contamination."

So right now, we stand here in front of you today knowing this: We have a drinking water aquifer that has contaminants in it and we have soil that can't be used.

So just to be sure, we asked the judge that sits over this case to interpret what they admitted to make sure that you, us, and them knew what rules we were playing with.

So go to the next page, please.

And this is what the court said. So we gave that argument that I just gave you to the judge, and he says, "The court agrees with Henning's interpretation and finds that the property subject of this suit is not suitable for its intended use, as Chevron

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admitted to the court in its limited admission."

Next, please.

This is the judge's ruling which applies to you. "After the public hearing, LDNR shall approve or structure a feasible plan incorporating the court's finding that, as a result of Chevron's limited admission, Henning's property contains contamination and is not suitable for its intended use. Ultimately, based on the court's finding of contamination, the public hearing and the parties submitted plans, LDNR shall, within the time frame permitted under Act 312, submit to a court a feasible plan to" -- and it quotes the statute. It says -- doesn't say "evaluate." Feasible plan definition says: "To remediate contamination from oil field and exploration and production operations or waste."

To remediate contamination. Go back to the definition of "contamination." Drinking water aquifer and soil that can't be used.

So today, I ask that when they put up witnesses today or tomorrow and they say the

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water's not a drinking water aquifer and they say the soil can be used for its intended purpose, remember what the judge says. But you can read the statute. You can read the definition of "contamination." These are rules we have to follow. These are rules that were set by the legislature.

This -- you can't just throw away the rules that we have to act under. And the State of Louisiana asks that you, as panel members, follow the rules set even if you don't like them. You might not like them. You might not agree with the definition of "contamination." You might not agree with what the legislature says. But those are the rules that we follow. And all I ask you today is, at the end of this hearing, is to follow the rules. That's all we ask for you -- from you and thank you.

JUDGE PERRAULT: Thank you.

Chevron, please proceed.

MR. GROSSMAN: Chevron will call its first witness, Mike Purdom.

MR. GREGOIRE: Your Honor, if I may approach? We have a hard copy of the slide deck that

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Mr. Purdam will use today. It's also going to be broadcast on the network for your convenience and the panel members.

JUDGE PERRAULT: Mr. Purdam, would you please state your name for the record.

THE WITNESS: Michael T. Purdam.

JUDGE PERRAULT: And spell your last name.

THE WITNESS: PURDOM.

MIKE PURDOM,

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

DIRECT EXAMINATION

BY MR. GREGOIRE:

Q. Good morning. Can you state your name for the record?

A. Yeah. Mike T. Purdom.

Q. And Mr. Purdom, what is your occupation?

A. I'm a geologist.

Q. And where do you work?

A. At Environmental Resources Management, also ERM.

Q. And tell us a little bit about what ERM Management is and what your responsibilities are at ERM Management.

A. ERM is an environmental consulting firm.

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I am based here in Baton Rouge, and I am a partner within the Gulf business unit. I'm the area manager for the Gulf Coast area.

Q. And how long have you been employed by ERM?

A. Four years.

Q. Tell us a little bit about what you do at ERM.

A. So I have kind of dual responsibilities. One, with my area manager role, I have some operational responsibilities for our Gulf Coast area; and then, secondly, I do soil and groundwater investigations through our what we call our LPMR group. It's the Liability Portfolio Management & Remediation.

Q. And how long have you been doing that type of site assessment, evaluation and remediation work at ERM or others?

A. Coming up on 30 years. I believe it's 29 now.

Q. Okay. And you've worked as your -- as your presentation reflects, on over 500 geological site characterizations?

A. I have.

Q. And that includes site characterizations

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that fall under the jurisdiction of LDEQ and LDNR?
A. That's correct.
Q. And that would include application of RECAP and 29-B?
A. Yes.
Q. By whom were you hired in this matter?
A. Through Kean Miller on behalf of Chevron.
Q. And talk a little bit about the areas of expertise; and that is, the areas that you consider yourself to have sufficient training and education and knowledge to be an expert in connection with what you have done throughout your career.
A. Yeah. So over the 30 years, I've -- my areas of expertise include site assessment, you know, characterizing the subsurface geological conditions that are at a site, looking at groundwater aquifers to characterize them and understand the groundwater characteristics, including subsurface geology, also done site remediation across the state and the application of the regulatory standards and procedures.
Q. And before we move on with your career and what you have done as a scientist, a geologist

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and hydrogeologist, where did you go to school?
A. LSU here in Baton Rouge.
Q. And what degree or degrees did you obtain?
A. Bachelor of Science in geology.
Q. So have you rendered expert analysis in connection with the evaluation or remediation of the environmental media at onshore properties in Louisiana?
A. Yes. Quite a few.
Q. That would include oil field sites?
A. Yes.
Q. You've also done some underground storage tank work?
A. I have.
Q. You've also worked with chemical plants?
A. Yes. I've done work across a wide variety of industrial, petrochemical, pulp and paper, oil field, midstream facilities across the state of Louisiana, really across the Gulf Coast area.
Q. Okay.
Have the constituents of concern that you have worked with in the past included chlorides?

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A. Yes.
Q. They included heavy metals?
A. Yes.
Q. Petroleum hydrocarbons?
A. Yes.
Q. Radium?
A. Yes.
Q. Have they also included naturally occurring constituents such as iron, manganese and sulfate?
A. Yes, they have.
Q. Have you worked with all environmental media; that is, soil, sediment and groundwater?
A. Yes, I've worked with all three of those.
Q. Have you represented clients before the Louisiana Department of Natural Resources?
A. I have prepared -- worked with the Department of Natural Resources on documents. I've not been a part of a panel like this before.
Q. You hadn't been a part of the hearing, but you've represented clients before the Louisiana Department of Natural Resources outside of the hearing context; right?
A. That's correct.

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Q. Have you represented clients before the Louisiana Department of Environmental Quality?
A. Yes.
Q. Let's talk a little bit about your licensure.
A. Sure. So I obtained my professional geologist license with the state of Texas in 2003 upon the initial offering of the state of Texas opening that up for licensure. Then in 2010, I obtained my professional geologist license in the state of Mississippi. And then in 2014, when the geoscience -- the Louisiana Board of Geologists opened that up, I obtained my PG in Louisiana and I've kept and retained all three of those licenses since I obtained them.
Q. And you may be somewhat repetitive of your testimony earlier, but I want you to hone in on your experience in Louisiana in site characterization and evaluation and remediation of various onshore sites. Can you describe for the panel that experience that you have?
A. Certainly. So I graduated from geology and -- with -- in geology from LSU in 1994, came out of school and immediately began working as an environmental geologist. And so those were my

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first investigations in Louisiana sites.
As Mr. Gregoire -- we talked about earlier, over 250 oil and gas-related sites, many of these being midstream: Pipelines, compressor stations, metering stations, but as well as some oil field E&P production sites.
I've worked on two Louisiana Superfund sites and then kind of a broad range of experience across EPA brownfield sites. I've done quite a few of those, specifically here in the Baton Rouge area and across Louisiana. Petrochemical, pulp and paper, power, power sites across Louisiana and the Gulf Coast.
Again, 28, I believe coming up on 29 years now, of Louisiana experience. And throughout that time, I've worked closely with the Louisiana regulators in evaluating and remediating properties at these sites.
MR. GREGOIRE: So at this point, I'll file and offer Mr. Purdom's curriculum vitae which is identified as Exhibit 147 of Chevron's exhibits.
JUDGE PERRAULT: Exhibit 1.7?
MR. GREGOIRE: Yes, sir.
And I'd also tender Mr. Purdom as an

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expert in geology, hydrogeology, site characterization, soil and ground water investigation and remediation, and the use of the applicable regulatory framework, including 29-B and RECAP.
VOIR DIRE EXAMINATION
BY MR. WIMBERLEY:
Q. Mr. Purdom, I'm Todd Wimberley. I deposed you earlier last year. Do you remember that?
A. I do.
Q. At that time, you'd told me that you'd never been qualified as an expert in a court of law in any court; is that correct?
A. I've never been offered up as an expert.
Q. You've also told me that are not an expert in 29-B. Do you remember that?
A. I remember saying I'm not an expert in 29-B, but I am -- I have -- an expert in applying the regulatory standards, which I've done in 29-B cases.
Q. But you're not an expert in 29-B?
A. I'm an expert in application of regulatory standards, yeah.
Q. And you're not an expert in human health

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risk assessment?
A. I'm not an expert in human health risk assessment.
Q. You didn't calculate the background at this property in the soil or groundwater; correct?
A. We -- we, ERM --
Q. You personally.
A. I did not personally.
MR. WIMBERLEY: I think that's all I have.
JUDGE PERRAULT: Redirect?
VOIR DIRE EXAMINATION
BY MR. GREGOIRE:
Q. Mr. Purdom, on how many occasions have you applied 29-B in connection with your site characterization, evaluation, and remediation of various onshore sites in Louisiana?
A. Of 29-B specifically? I know of at least 20 sites that I've done 29-B.
Q. And you don't purport to be a human health risk assessor; correct?
A. Correct.
Q. But you're aware of the regulatory framework as embodied in RECAP; correct?
A. Absolutely.
Q. How many times have you used RECAP in

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connection with site characterization, evaluation, and remediation?
A. It's over 100 sites.
JUDGE PERRAULT: Any objection to this witness being an expert?
MR. WIMBERLEY: We object to him being an expert in 29-B, as admitted.
JUDGE PERRAULT: What does Chevron say to their objection to 29-B?
MR. GREGOIRE: Your Honor, Mr. Purdom has testified he's used 29-B extensively in his work in representing various clients in Louisiana.
JUDGE PERRAULT: I'll overrule the objection. I'm going to allow it.
And state again what areas he's...
MR. GREGOIRE: Sure. Geology, hydrogeology, site characterization, soil and groundwater investigation and remediation, and the use of the applicable regulatory framework, including RECAP and 29-B.
JUDGE PERRAULT: Okay. He shall be allowed as an expert in those fields.
DIRECT EXAMINATION
BY MR. GREGOIRE:

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Q. So Mr. Purdom, can you describe for the judge and the panelists a road map of what you will testify about today?
A. Sure. I know I met a number of you on the site, and so we'll just go through and talk about the chronology, what occurred at the site through our records that we've obtained, we'll look at the site setting of the property itself, and then we'll also be looking at the Chevron most feasible plan areas, including a sampling survey to go over with some of the results.
Q. So you're first going to address the chronology of uses at the property; is that right?
A. That's correct.
Q. Tell us a little bit about what you did, and others at ERM, in preparing your understanding of the various historical uses at the property.
A. Yes. So we had multiple areas that we are -- and sources of information that we obtained. So that being actual records from the Chevron files that we were able to review and look at. We also looked at the Department of Natural Resources SONRIS database to go through all of the records of wells and any historical activities that had gone on at the site, and we also included

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aerial photography. So we went back and looked at aerial photography, starting from 1940 moving up until the present day, to understand the operation that had occurred at the site.
Q. So we start with your chronology with the beginning of oil and gas operations on the property?
A. Yes. So it's beginning in 1938.
Q. What occurred next as far as it relates to the Chevron entity that operated at this property?
A. Yes. So Chevron or its predecessor, Gulf, operated starting in 1941 and operated at the site up until 1984.
Q. Did other oil and gas properties [sic] operate on the Henning property during the time that Chevron operated?
A. They did, yes.
Q. And what companies were those?
A. We've got it outlined here. H.L. Hawkins, Shell, Coastal States Gas, and there were other entities that also operated.
Q. And when did Chevron's operations end?
A. In 1984.
Q. Did other oil and gas companies operate

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or continue to operate on the property after that point in time?
A. Post-Chevron, yes, they did.
Q. And so next, we have, as everyone is aware, the amendments to 29-B occurred in 1986. Is that right?
A. That's right.
Q. And that was two years after Chevron ended its operations on the property?
A. Correct.
Q. And RECAP was promulgated in what year?
A. 1998.
Q. Okay. Now, we move forward, fast-forward to 2017. And we have an environmental site evaluation which was prepared for the Henning property. Can you describe and talk about that?
A. Yes. So a lot of times -- well, most times when someone is purchasing a property, lenders or -- in order to evaluate the property, an environmental site evaluation, often referred to as a Phase 1 ESA, will be conducted at the site.
In 2017, the Henning Management did authorize an environmental site evaluation by

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Arabie & Associates to evaluate the site prior to purchase.
Q. So Henning Management retained an environmental consultant to review the property for any potential environmental impacts before he purchased it?
A. That's correct.
Q. That entity was Arabie & Associates?
A. That's correct.
Q. Is that the same Arabie & Associates that landowners have typically filed in these legacy lawsuits to defend them?
A. Yes, it is.
Q. And so we fast-forward to 2019, when the lawsuit was filed; is that right?
A. Yes.
Q. And since that time, there have been various investigations, sampling, and reports that were provided both in the litigation and leading up to the most feasible plans that were filed in this case; right?
A. That's right. Those field investigations were conducted from 2019 through 2022, and we'll get into, a little bit later, some of the extensive investigation that was done.

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Q. Let's talk a little bit about the site setting and your understanding of that setting. And we'll start with the limited admission areas. Can you explain what the boxes that are delineated in different colors are?

A. Sure. So the black and white, kind of, checkered pattern, as we'll say it, what's shown here is the actual property boundary for Henning Management. And then what we have here is Areas 1 through 9 outlined, and those are the limited -- well, the areas of investigation. Chevron limited admission areas are Areas 2, 4, 5, 6, and 8.

There is two other areas, Areas 1 and 9, that are kind of dashed gray lines. Those are ICON-identified background areas, and then Areas 3 and 7 are areas that were not operated by Chevron.

Q. So let's move next to the actual site setting. What do you know about this particular site?

A. Yes. So up towards the very north -- I'm seeing if I can get my -- oops.

Can you go back? I'm trying to get my pointer going.

To the very north of the property -- of the picture here, you see the southern part of the

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town of Hayes, Louisiana. It's approximately 1262, so about two square miles, located at the border of Calcasieu and Jefferson Davis Parishes.

You see there's kind of a curved line that you see. That's the Louisiana Highway 14, which bisects the property. And so on the east side, you see primarily active rice farming and on the west side of the property is predominantly fallow field. You can see a water body on the kind of far right side of the property, which actually comes across the property at some point on the very eastern side, and that is Bayou Lacassine. And the land uses have been primarily rice farming and oil and gas for approximately the last 80 years.

Q. Did you visit this site, Mr. Purdom?

A. I did. My first visit was December of 2021. I went two more times in 2022 and then a fourth time with the DNR representatives. I think it was October of 2022.

Q. Did you visit the limited admission areas that you just testified to during your site visits?

A. I did.

Q. Okay. Did you notice any surficial

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salt-scarring or other evidence of Chevron's oil and gas operations other than the -- what we'll talk about a little later as the blowout area?

A. Yeah. Other than the -- there was no surficial scarring or any type of indication of impacts.

Q. So can you describe for the panel and the judge the site topography?

A. Yes. So this is a USGS topo map, and it basically shows the elevation of the property. You're sloping -- you're gently sloping from about 6 feet above mean sea level towards kind of the north, northwest portion, coming down to about zero feet above mean sea level or at mean sea level towards the southeastern part of the property.

Q. And also describe for the panel members the elevation, surface elevation at the property.

A. So this is LiDAR data that we -- Light Detection and Ranging Data that we pulled as well. It confirms really what the previous map showed, showing the elevations being about 6 feet above mean sea level towards the north, northwest, gently sloping to about a zero over towards the south, southeastern part, going towards Bayou

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Lacassine.

Q. And you also performed research about the flood zone capacity in the area?

A. We did. So this representation, here again, you see the property outlined in the black and white. So we are shown within the base floodplain, according to the FEMA zone maps, which showed about a 1 percent annual chance of flooding.

Q. And you also performed research about the wetlands characteristics in this area, including the property; is that right?

A. That's right.

Q. What did your research reflect?

A. So this is a map from the U.S. Fish and Wildlife Service, showing the wetlands that were mapped. The majority of the property is shown as not being wetlands, but you do see, over towards the eastern side, we do have some freshwater emergent wetlands over towards Bayou Lacassine, as well as some forest -- freshwater forested shrub wetland. And then you do see also another little area to kind of the north, northwestern side where there's some freshwater emergent wetlands.

Q. And on the northwestern side of the

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property, that's the location where the blowout of one of Gulf's wells occurred; is that right?
A. That's correct. And you can actually see it here mapped in the little blue circle on the northwestern side.
Q. So that blowout location is located in a wetlands area, as opposed to uplands?
A. It is.
Q. And describe for the panel what this means, the drainage basin subsegment, as it relates to the property.
A. Yes. As the panel's probably aware, Louisiana Department of Environment Quality maps the -- basically the drainage within areas to see where it's captured and where it flows.
So you see the small black and white box here. That again is our property. The yellow line -- or the yellow outline indicates the DEQ drainage subsegment. So in this case, it's Lacassine Bayou from headwaters towards Grand Lake; and those designated uses are primary and secondary contact recreation, fishing and wildlife propagation, and then agriculture.
Q. What is the composition of the shallow soils at the property?

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A. Primarily consisting of clays and silts, and this is a map from the USGS showing that. This is actually confirmed too with our actual on-site, our soil boring logs that we took. So when we were collecting the samples, we would see the same thing.
There is -- go back, if you don't mind just real quick.
So there's a little bit of an alluvial deposit over towards Lacassine Bayou and, again, in that sliver going towards the northwest part of the property where the wetlands were shown.
Q. And if you can describe the surface soil characteristics at the property?
A. Yes. This map is a U.S. Department of Agriculture surface soil type, and it shows that basically it's a very poorly drained silt, silty loam.
Q. Next, you have the cross-section locations. Can you describe what those are and the purpose of your including those in your testimony and presentation today?
A. Sure. So these are the ERM and ICON well locations. And what we've done here is to try to get a good understanding of the subsurface

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geology. We have constructed -- well, within our expert report, we constructed four cross-sections. Two of them are -- of those are east to -- I'm sorry. West to east represented at AA prime, and you see that goes really across the entirety of the property, including the two background areas, Areas 1 and then, over to the eastern side, Area 9.
BB prime, we're going to show both AA prime and BB prime here in just a minute, but that actually -- we wanted to see what the subsurface geology was like right there at the blowout area and then we've got two additional cross-section locations to understand the subsurface geology running more on north to south, CC prime and DD prime.
Q. So Mr. Purdom, your cross-sections tracked the aerial extent of the oil and gas operations that Chevron conducted on the property?
A. That's correct.
Q. And they also track the background locations at this property; right?
A. Correct.
Q. Now, ICON, which is the consultant for Henning Management, determined the location of

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background or the background locations --
A. That's correct.
Q. -- at this property.
And that's on the eastern side of the property?
A. Yes. Over -- it's H-32 A and B and H-33 and 34.
Q. So let's go to one of the cross-sections, cross-section A to A prime. Can you describe to me what the lithology reflects in these cross-sections and what is of significance to you?
A. Yeah. So if the panel remembers, this is the cross-section that went the entirety of the length of the property. So this spans quite an extensive area that we investigated.
So I think the first thing that's of note to me is these green colors that are showing up, representing that these are clays or silty clays, very nonpermeable zones, and you see that really dominates the subsurface geology here.
There are some areas represented with -- it's kind of more, I guess, brown here, where it is more clay or clayey silt -- I'm sorry, silt or clayey silt, indicating potential for some -- some

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areas for some -- some groundwater in, you know, the areas. Of note, I think -- a couple other things I want to note is the -- we look a lot of times to correlate and see if there's connectivity within the zones to see if there's communication across this. And you'll see quite a few instances -- I'll point to H-26 versus H-27 where you'll see some brown, more permeable thin zones that aren't present. You know, there's really no correlation from boring to boring. Those are also shown between MW-10, H-18, H-19, H-1 as we are going really through the operational areas. There's really no good way to connect these small thin zones.

Q. Let's go next to the next set of cross-sections, B to B prime. And again, what do those cross-sections tell you about the site lithology?

A. Yes. So this is more in the direct area of the blowout. And you can actually see, we've actually mapped the blowout pond or blowout area on this cross-section. And again, so this is more in operational areas. And what you'll see -- first of all, we didn't just draw this pond. This is the actual depth that we measured for the pond.

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So we went out there, did a physical survey of the pond to determine how deep that pond is and to also understand that there's a connection with the shallow groundwater zone that's out there. And we did not see that, as you see. Right at H-9, the depth to water there is -- or the depth to the zone there is right around 45 to 55 feet. And there's also another line of evidence that's maybe kind of hard to see on this cross-section. But at H-9, you can see where we've got the water level plotted. The -- versus the actual elevation of the water in the pond. And those show a difference in elevations. It's a little bit difficult to see here, but we surveyed both the pond elevation as well as, when we were doing our potentiometric mapping, we looked at the elevation of groundwater, and there is a difference there, indicating there is no hydraulic connection.

Q. At what depth does the shallow groundwater begin in the subsurface of this site?

A. It -- well, it varies. So over towards the eastern side of the property, over close to Bayou Lacassine, it is a little bit shallower over there. I think it's as shallow as maybe about 20 feet. But as you get into more of the

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operational areas, it's generally in the -- at least 30 feet, but it can go down to about and into the 55 to 60-feet range. So again, some of those cross-sections show the variability and where those locations are and the depths.

Q. Now, it's your conclusion that the pond at the blowout location is not in hydraulic communication with the shallow groundwater; is that right?

A. That's correct.

Q. We'll get to it later, and some other witnesses will also address it.

But have you seen any evidence of hydraulic communication between the pond itself and the Chicot Aquifer?

A. No. And we've got also differences in groundwater elevations between the Chicot that we have looked through historical records, as well as the elevations in the upper water-bearing zone and the pond itself.

Q. And for the panel's use and edification, at what depths does the Chicot Aquifer exist at this site?

A. The Chicot starts around 120 feet and goes down to at least 200.

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Q. There is a fairly large clay confining unit that separates the shallow groundwater in the Chicot; is that correct?

A. That's correct. We went down around -- to I believe our deepest boring was 78 feet. At the -- actually, right at the blowout area.

But the lowest extent of the upper parts of that water-bearing zone were at the 62, below-ground surface. So we've got a good 50 feet of separation between the upper limits of that upper water-bearing zone as well -- and the upper limits of the Chicot.

And I guess one more point I'll bring up here is we did take a series of geotechnical vertical permeability tests. And one of those is represented here at H-16 R. You'll see it was at the base of the boring within that clay and it was a 1.1 times 10 to the minus 7. We took two other geotech samples down at depth, and those were all in the 10 to the minus 7 to the 10 to the minus 9 centimeters per second, so fitting the definition of a natural liner.

Q. So next, you're going to talk about water wells, at least your research about water wells.

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RECAP requires or calls for the determination of water wells that are located within a mile of the AOI for the purposes of the groundwater classification; is that right?

A. That's correct.

Q. So explain to the panel the work that you and others at ERM did in researching the water wells at this property and outside of the property.

A. So what we do is we identify the 1-mile radius of the property boundary. So that's identified on this figure with that red kind of cloudy-looking figure or line.

The blue line that you see basically running along Louisiana Highway 14, that is actually a public water supply line location. So and it does dissect and runs along the property. But then we take the LDNR SONRIS database, we find all the wells within a 1-mile radius and plot those, and that's what you see represented here, is -- are those wells that were located within the 1-mile radius. None of the wells that we have shown on here are within that upper water-bearing zone, to the 20 to 60 feet.

Q. So you mentioned the public supply line

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that crosses or traverses the Henning Management property; is that right?

A. Yes.

Q. That's the water supply line for Jefferson Davis Parish?

A. That's correct.

Q. Would Mr. Henning be able to tap into that line?

A. That's our understanding.

Q. So summarize for us generally -- and you've talked about some of this already, but the results of your research of the water wells on-site and off-site.

A. Yeah. So this comes from the SONRIS database. So there were two active -- and we've got active here -- registered rig supply wells located on the property. When we did our investigations, we went looking for those to see where they were. We could not find them. So we believe that the records just weren't -- have not been updated. We believe they're P&Aed.

There was 15 active water wells screened in the Chicot Aquifer in the 1-mile radius, one of those being an irrigation well, 11 domestic wells, three supply. And the shallowest of all those

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wells, those active wells, is screened at 120 to 125 feet, so well below the extent of what we've seen here on the property that we're evaluating.

There was also another well on the property. We couldn't find it in the SONRIS registration and on the database, but it's 10 inches in diameter, approximately 200 feet, and when it was tested in 2017, it produced 3500 gallons per minute. It's in good condition, but the picture of the surface equipment here shows that some of the surface equipment's not all that in great shape.

Q. Where is that water well located, again?

A. It is basically on the road where -- if the panel were to have been out there, I believe it's Area 5 where we pulled in, there's a parking area right there. It was just off that little road where we came in, and I'll show you it here, and I think I put it in the next figure.

Q. So there are no shallow wells that you've ever known of that exist at the Henning property? And I say "shallow wells." Wells that are screened in the shallow groundwater?

A. That's correct.

Q. As well as off-site within that mile

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radius?

A. That's correct.

Q. So you've already talked about the public supply water line that crosses the Henning Management property.

What other water sources are there for Henning Management?

A. Yeah. So this map, it may be hard to see, but you'll see a blue dot just off of Louisiana Highway 14. That is the location of what we believe to be the unregistered water well that can produce 3500 per minute. There is the public supply line, which we show there in the blue. And this was actually the drone footage that we took last year. This bottom picture, where you can see Bayou Lacassine, you can see basically the ditch system that's used to -- for Mr. Henning to do the pump on and pump off to be able to supply water to his fields.

Q. And before we move forward, just for the benefit of the panel and Judge Perrault, at the bottom of each of the slides, there's an exhibit reference; is that right?

A. Yes.

Q. And that describes or shows the location

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within Chevron's exhibits where this particular slide or set of slides can be found, if anyone wants to go back and review them.

A. That's correct.

Q. Most of the slides that you've shown thus far are contained or encapsulated in Chevron's proposed feasible plan from ERM?

A. That's correct.

Q. So let's next pivot to the potentiometric map that you have here. Explain what this is and what it shows.

A. So when we put in -- I'm sure the panelists know, but when we put in a well, we go and we survey the top of casing of where that well is to get an actual elevation of where that top of casing is. Then when we want to determine groundwater flow direction, we'll go out and we will drop a piece of equipment to measure the depth to the actual groundwater level. So as soon as we hit that, we'll know how many X feet down.

We then take that difference to come up with the groundwater elevation. And so we put all those together on a map to be able to contour the map to show groundwater -- the direction of groundwater flow and where it's moving.

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Q. And you have another potentiometric map. How does this one differ from the one you just testified about?

A. Very similar in nature. Both of these were taken on December 21st of 2021. This one is the equivalent freshwater head, so it's taking into account some of the density of the water which could be a result of chlorides. But you do see really the same general flow direction being to the north, kind of northeast over by Bayou Lacassine. Toward the background area, you do see a little bit of a reversal there at that one area, but really the two maps, whether it's just the straight taking the elevations or looking at the equivalent freshwater head, you do see the same flow direction.

Q. Real briefly, we went through the chronology earlier, but you include in here the number of wells that were drilled at the Henning Management property historically; is that right?

A. That's correct. And we -- that is 19 wells from -- since 1938.

Q. And how many of those wells were drilled by Chevron?

A. Total of seven.

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Q. And the other wells obviously were drilled by others?

A. Correct.

Q. Now, you noticed in your site inspection some identification or evidence of -- on the surface of an abandoned oil and gas operation?

A. Correct. And we'll see that through the drone photography. We'll point it out. But there is a shut-in well on the property. It's not related to the Chevron operations, and the remainder of the property is predominantly rice, rice farming.

Q. And this photograph shows the locations of the wells that were drilled on the property?

A. Correct. Oil and gas wells only, correct.

Q. And Chevron wells are marked in what color?

A. They're as indicated in the end area to the right, they're -- in the yellow circles shows the Chevron wells.

Q. And the nonChevron wells are in the other colors, presumably blue, green, orange, and a purple, or a magenta?

A. Correct.

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Q. So now we have here some historical aerial photographs. This is in 1940. Did Chevron have any wells on the property that it had drilled at that time?

A. No. So operations did start -- oil and gas exploration started on this field in 1938, but -- or on the property. But Chevron had not yet begun operating.

Q. Next we have a 1952 aerial photograph. Are there any parts of this aerial that have some significance or bearing to you?

A. Sure. Over in Area 2, you kind of see the white area with the circle around it. That is the blowout area. So we'll start showing some more significant details around that here shortly, but really that's the main feature that stands out in this.

Q. And that blowout occurred in 1941?

A. 1941; right.

Q. And you testified earlier and we'll see some more pictures of it, but there is a pond that currently exists in that location; right?

A. There is. And we did some investigation there, which we'll talk about as well.

Q. And that's a freshwater pond?

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A. It is.
Q. Let's move next to 1970. Anything of significance to you on this aerial photograph?
A. You do see -- start to see where there's been some more, obviously, oil and gas operations. You can start to see in some areas some potential what look to maybe be pit locations, but you do start to see the development as an oil and gas field further.
Q. Some of those are Chevron pit locations?
A. Some of them are, yeah.
Q. How many Chevron pits could you identify or can you identify on this aerial?
A. Possibly one, two. I can see two that I believe I would call pits.
Q. There's also a pit that looks -- appears to have been used on the southern part of the property unrelated to Chevron's operations?
A. That's correct.
Q. And that's more towards the southern, almost the -- right north of the southern boundary --
A. That kind of pops out, yes.
Q. So next we move to the 1985 aerial photograph. Chevron's operations ended at that

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time; is that right -- before that time?
A. Yes. So Chevron had stopped, ceased operations in 1984. So this is one year post Chevron ceasing operations.
Q. And then we move to 2008. Anything of significance to you on this aerial photograph?
A. What I'll note is the blowout pond area or the blowout area seems to be, you know -- almost looks like it's shrinking in size, but there's a couple other things that I want to kind of look at here.
So really, in the area over here to the far left where there was a dry hole, you can start to see evidence of row crops, and I think that's going to start to play an important discussion piece later on about some of the reworking of the land. So you can start to see that there's farming operations going on there and as well as over to the eastern side of Highway 14.
Q. Then we move to the 2017 aerial photograph. This is around the time that Henning Management purchased the property; is that right?
A. That's correct. So this is approximately the time -- in 2017 was when the environmental site evaluation was conducted at the

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site.
Q. Anything of significance to you in those aerial photographs?
A. You do see some operators outside of the Chevron area just adjacent to some of the Chevron areas, but that's the main part.
Q. Do you see or does it appear, as you saw in one the earlier photographs, any evidence of farming development or agricultural development?
A. Yes. You do see, it looks like the land there, especially to the western side, is well-maintained and appears to be used for farming.
Q. Then we move next to the 2019 aerial photograph, is the year that Henning Management filed suit; is that right?
A. That's correct.
Q. We don't have any, what appears to be any scarring around that blowout area?
A. That's correct.
Q. So let's talk about the Chevron most feasible plan areas. And when you say "MFP," that's what you mean, most feasible plan; right?
A. That's right.
Q. So we're going to ask you to identify or

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at least to summarize the sampling soil and groundwater that occurred at this property as a part of this lawsuit and this regulatory proceeding.
So can you describe a little bit about the sampling program?
A. Sure. And I do want to point out that the pictures that we're showing, these are all site pictures taken at the site. So the last picture was us doing the pond survey. This picture here is one of our scientists taking a hand auger boring, but we've done extensive sampling across the site. Over 650 soil samples were collected from 102 locations. If you go -- the 61 groundwater samples from 31 monitoring wells, performed slug tests at 17 wells, 12 of those being ERM-installed wells, five being the ICON wells.
We did take the surface water samples. And we'll discuss the surface water samples, but we did actually look -- when we did the pond sampling, we looked at a zone kind of 2 feet below the surface of the water surface as well as 13 feet below -- you know, towards the bottom of the pond to see if there was any stratigraphy -- you

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know, stratified columns or anything within the pond. So we did take surface water samples from the pond. Twenty-four electrical conductivity probe logs were performed.

Q. And just to make sure everyone understands, what are electrical conductivity probe logs?

A. So that's when you're geo probing, I think one of the pictures we saw earlier shows a geoprobe rig standing up. So what they did is you'll push down this probing of this rod -- through a rod is a probe log, and it will measure basically the conductance of the soils of that -- or the media that it's encountering. And as it responds in a positive way, that's showing that it's more -- has more conductivity, conducive of areas where there might be chlorides or impacts.

Q. And you also had HPT probe logs that were installed at the property; is that right?

A. Yeah. This is a Hydraulic Profiling Tool, which is basically used to give an indication of porosity, permeability, is there ability to transmit water.

Q. You have numerous site inspections that occurred by ERM?

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A. Yes. Throughout -- I've been out there four times. I know there's been multiple visits by a lot of our other experts throughout the 2019 through 2022.

Q. Of course, you have drone-level photography that you alluded to earlier and that we'll observe in a bit; right?

A. Correct.

Q. So if you can briefly describe the soil sampling areas for the panel.

A. Yeah. So what we have here, again, this is our figure that we -- I think this is a 2019 aerial, and what you see is the orange dots that are represented are ERM soil sample locations that were done to try to delineate or investigate further the results initially reported by ICON. The yellow dots are ICON-installed soil sample locations, and then you do see a few little purple dots, and those were conducted by HLP and those are outside of Chevron's area, so not included in the limited admission.

Q. So did you sample for 29-B constituents in the soil?

A. We did.

Q. And what constituents were those? The

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whole suite of 29-B constituents?

A. Yes.

Q. Did you also sample under RECAP, or constituents that are found in RECAP?

A. We did. We looked at metals, BTEX, THP. Let's see. Radium, as well as some others.

Q. So let's hone in on Area 2. Of course, this is the area where the blowout occurred. Can you describe for the panel the sampling locations and the reasons for them on that -- in that area?

A. Sure. So this really just shows kind of the -- so ICON had installed sample location H-9, and then ERM went out and, in order to delineate and investigate -- we're going to look at the actual results here shortly just to show those, but these are some of the locations and including some monitor wells that we've installed around that blowout area to help with the delineation.

Q. And then we move to Area 4, which is the area also where Chevron conducted oil and gas operations; is that right?

A. That's correct. And again, the orange dots represent ERM's efforts to go evaluate the concentrations that were initially reported and delineate.

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Q. And the yellow locations are ICON sample locations; is that right?

A. Correct.

Q. Then we move to Area 5. That's another area where Chevron conducted oil and gas operations; is that right?

A. That's correct. And you see the ICON locations represented in yellow, ERM represented in orange, and then you also see the area over to the -- to the east of the Area 5, which is an adjacent operator, not Chevron.

Q. So Chevron didn't operate on that property outside of the blue box that is directly east, where you have some sampling points?

A. That's correct. And for the panel, this is that -- you can start to see a little bit of an outline of where we parked when we first got there, for those who have visited.

Q. The sampling points that are located directly east of Area 5, whose sampling points are those?

A. Those were HLP.

Q. And who is HLP?

A. I forget the --

Q. They weren't hired by Chevron?

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A. They were not Chevron's representatives and not hired by us.
Q. Then we have Area 6. Can you describe the soil locations there?
A. Again, one of the things that kind of sticks out on this photograph is that area outside of that blue line because it holds a lot of water. That was an adjacent operator that was not Chevron. And when we've been out there, that holds a lot of water. The Chevron area is there within the blue outline, and this being Area 6, you do see the yellow borings or sample locations from ICON, the orange representing ERM.
Q. Then we have Area 8, the last area that's subject to the limited admission. What does the sampling reflect there in the locations?
A. Again, trying to go and delineate, and we're going to talk about this here in a little bit, but you're going to see -- you see we were trying to delineate, and you start to see kind of a linear pattern and how we're having to go off this, and I'll point out that that's actually a road that's going right there.
So potential for when they were getting the field reworked, that -- in order to come up

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and do farming, agricultural operations, that potentially barium -- well, we'll talk about barium here in a minute, but barium was potentially spread through the area.
Q. And here, we have the monitoring well and surface water sample locations; is that right?
A. That's right.
Q. And what were the general depths of the monitoring wells that were installed at the site?
A. Yeah. Generally, again, I'll refer you back to the cross-sections to see where everything was. But generally from about 30 to about 55, 60 feet, if you do look over, again, to the eastern part of the property, in Area 9, you do see those numbers in parentheses are where the actual wells were screened. So you see some 18 to 28, 20 to 30, so some shallower zones over towards the far east, but you really don't see that as you move back across the table.
Q. And the actual tables with the sampling data are included with ERM's plan on behalf of Chevron; is that right?
A. That's right.
Q. And you say surface water sample locations. You mentioned the pond where the

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blowout occurred. Surface sampling occurred there. Did they occur anywhere else, the sampling surface water?
A. The surface water sampling? No.
Q. So next we have the EC and HPT logs which you testified about and described earlier. What do those show or reflect to you?
A. I'll point the panel to H-12, which is the, kind of, bigger box over here to the upper left. That is a good -- a good representation of what a positive response within the EC log is. So that shows, down around 50 to 60 feet, that there was, you know, good conductivity. And that's also reflected in our groundwater sample results that we've collected. So a good indication of that there's likely some chloride there, and we did confirm that with the results.
I'll also point the panel to, if you look down, just as it quickly comes back to basically being non- -- you know, nonconductive. So we quickly get out of that chloride and, again, we took soil samples below this and confirmed these results, that the chlorides just aren't there after we got out of that zone.
So you'll start to look across. There's

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other examples, H-16, towards the top there, kind of top-middle, you do see a little bit of a signature up towards the -- I guess that's about the 20 to 30-feet range. But you do see it come back down. And, really, what these are showing is you'll see some impacts in some areas where there were historical operations. But as we move laterally out from those locations to delineate, we're not seeing those same signatures.
Q. And next, we have the background locations. And can you describe -- you've already testified about it but where those locations are?
A. Yes. So we have Area 1 over to the far west side of the property, H-25, 26, 27, and then Area 9 being the two wells installed around H-32, being A and B, and then H-33 and 34 in Area 9.
Q. And all of those background locations, as you've testified earlier, were selected by ICON?
A. That's correct.
Q. You visited the property, as you stated, on at least four occasions?
A. Correct.
Q. Did you visit the background locations during your site visits?

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A. On multiple occasions, yes.
Q. Did you find in your boots-on-the-ground, or your site visit, any vestige of oil and gas operations in the area of the background locations?
A. No.
Q. Did you see any vestige of oil and gas operations in the vicinity of the background locations in any of the aerial photographs that you reviewed?
A. No.
Q. So this sets forth the results of surface water sampling at the pond at the blowout location; is that right?
A. That's right.
Q. So what I want you to first describe are the efforts that ERM and its contractors extended in obtaining surface water samples, and then I want you to describe the results of those samples.
A. Yeah. So, you know, it's easy to say let's just go grab a water sample. At ERM, we have a pretty robust safety program, so it was actually quite a bit of effort to go actually do this sampling. But what we did is we got a boat. We had to go through all of our internal

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procedures. We got a boat out there on-site. There was a picture earlier in the slide where you actually saw two of our ERMers in the boat. So we dragged that out there, got out on the boat, took a pump with some flow-through meters, taped off some tubing to a measuring tape, and dropped that down 2 feet below the water surface, and then started pumping from there to obtain our 2-foot below-surface sample. And then we did the same thing with the -- down to 13 feet. So we measured down to 13 feet, which is 2 feet above the deepest part of where we measured this at the pond, and collected samples from the 13-foot zone.
Q. And what were the results of the surface water sampling?
A. You see here they're pretty -- there's -- really uneventful. So we show no BTEX constituents. Everything was nondetect. Chloride being both in the 2 and 13-foot samples are almost identical, again showing there's really no stratified columns of constituents. And the same with barium. And I'll also point out, when you looked at the LDEQ subsegment, chloride for that subsegment was listed as, I believe, 90 milligrams per liter, so we're even less than what it's

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showing on that DEQ subsegment.
Q. Would you describe the characteristic of that pond as being freshwater?
A. I would.
Q. So let's next move to the sampling results, and we'll start with barium sampling in the groundwater. What did the sampling program reflect?
A. So what we show here is the barium results in the groundwater wells that we collected. We have one well right there at Area 2, at H-12, where we showed an exceedance of the conservative groundwater screening standard being the -- the standard being 2. We were just over it: 2.27.
Ms. Levert will get into additional RECAP analysis to show that, you know, this is very -- it's still protective of human health and the environment. And you also see the rest of the samples all came back very, very low. When we had detection, it was very, very low and below the RECAP screening standards.
Q. Now, you did not do the work in connection with groundwater classification at ERM on this particular project; is that right?

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A. I looked at it, I observed it, but I did not do that myself.
Q. The conclusion is that the shallow groundwater is Class 3; is that right?
A. Correct.
Q. Now, in connection with barium, the comparative standard that you used for barium even though your conclusion was that it's a Class 3, was the Class 1 drinking water standard as the most conservative approach; is that right?
A. That's correct.
Q. So you had one slight exceedance of barium using that Class 1 drinking water standard, which Ms. Levert will further address from a human health standpoint?
A. That's correct.
Q. Let's next move to the sampling results for chloride in the groundwater. What do they show?
A. Again, so what we have here is this blue bold is showing where we exceed a background of 687 milligrams per liter. So we do see some chlorides in the groundwater, especially you'll see the highest concentrations are right there at the blowout area, down around the 50-foot zone,

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which correlates well with the EC logs that we showed.

What you do, though, see in the groundwater is rapidly declining conditions as we move away from the areas where we had detects. And we feel like we're delineated across the site with one exception where we've proposed an additional monitor well to the north, just to the north of Area 2, to supplement the data that we have.

Q. So one thing of note in connection with the chloride results in the groundwater -- you said it earlier and it's -- you can see it towards the bottom of this screen, that background for chlorides at this site is 687 milligrams per liter; is that right?

A. That's correct.

Q. So the secondary drinking water standard for chlorides itself is based upon aesthetics and taste; correct?

A. Correct.

Q. And that's 250 milligrams per liter?

A. That's correct.

Q. So background chlorides in the groundwater at this property is more than two

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times, almost three times what the secondary drinking water standard is; is that right?

A. That's right.

Q. So let's next move to radium in the groundwater. And briefly what does this show and who would you defer to for this analysis?

A. Yeah. So this is showing the radium results that we've gathered across the site, and really this is going to be Dr. Frazier will be speaking to the radium results.

Q. Next we have sulfate in the groundwater. Mr. Angle will address or at least perform an analysis of sulfate itself in the groundwater. But what does this generally tell you?

A. Again, really no -- nothing above any regulatory standards that we saw, but Mr. Angle will go into deeper analysis there.

Q. And next we have benzene in the groundwater and we have a couple of exceedances that are found near the blowout location; is that right?

A. Correct. Those are the only two locations. The conservative groundwater screening standard for benzene is .005 milligrams per liter, so we do have two exceedances. The remainder of

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the site remains unimpacted by benzene.

Q. Mr. Angle will address, along with Levert, those two exceedances and their proposal for handling; right?

A. Correct.

Q. Next we have the hydrocarbon sampling in the groundwater. What do those show?

A. So ICON took TPH mixtures and reported some results that -- so ERM went to go further investigate. In accordance with, kind of, the preferred RECAP method on evaluating TPH, we took the fractionation data for each of these which shows specific carbon chains or carbon to evaluate against those standards, and we showed no impacts above any regulatory standards here.

Q. Okay. Let's do a little deeper dive into the Chevron most feasible plan areas. Let's first start at Area No. 2. What were the historical uses at that part of the property?

A. Yeah. So we're showing here, this is an aerial photograph taken when we did the drone survey on the left, but the well -- this is the blowout area, obviously, and it was drilled by Gulf in 1941, which is the same year that the blowout occurred. Subsequent to that, it's been

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agricultural use.

Q. And then this is a drone image of that area; right?

A. That's correct. So we're flying over here towards Area 2. I'll point out, towards the bottom treeline here over to the left, you're going to see our friend the alligator who has been observed every time we went out there. So a lot of lush greenery. There's -- over to the top-left there, you can kind of see a little bit of one of our wells sticking out of the ground.

Q. And what were the results of the sampling for 29-B salt-based constituents at Area 2?

A. Pretty uneventful. So even though this is right there at the blowout area, there was one location within the upper 3 feet which showed an exceedance of SAR. It's H-12 from zero to 2 feet, you'll see an SAR exceedance. So that was a zero to 2-foot sample. We then went back and resampled that well location going at 1-foot intervals to determine the stratigraphy and also in working with the effective root zone, which Mr. Patrick Ritchie will be discussing later.

Q. So Mr. Ritchie will discuss the root

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zone, and Mr. Angle will address that one -- and what was the sampling location where you found, immediately below the root zone, an SAR and ESP exceedance?

A. Yes. So this was just SAR, and it was at H-12 from zero to 2 feet.

Q. And Mr. Angle will address that in his testimony?

A. That's correct.

Q. Taking into consideration Judge Cain's ruling, which Mr. Carmouche prominently broadcast earlier; right?

A. Correct. I will point out one more thing on this. So the blue boxes that you see on these tables represents where we did take SPLP samples to -- within the unsaturated zone. So you see we've got a good collection of SPLP data at this area, within this area.

Q. Did you see any particular trend associated with the salt signature in the soil at this property?

A. Really, there was -- it was pretty uneventful within that upper -- upper area, there really wasn't much to look at. Again, it was just one area within the zero to 2-foot sample that was

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really the only thing that we needed to go evaluate a little further.

Q. And when taking into account the effective root zone, is it your opinion and others who will appear this week that salt has been delineated vertically and horizontally in the soil?

A. Yes.

Q. Let's move next to barium and the results that you found in the soil at Area 2.

A. You're going to hear this story over and over and over when we go through each of these areas on barium. There's kind of a little bit of a story to tell on each -- on -- that repeats itself.

So one, you're going to see it's limited to zero to 2 feet where we showed the exceedance of 1600, which Ms. Levert will discuss in her testimony that number being extremely conservative.

So it's confined within the zero to 2-foot range. You do start to see low concentrations. Again, Ms. Levert will address that with her RECAP and risk assessment analysis.

And then you also start to see, in some

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areas, a not very good correlation with the operational areas versus where we're actually seeing this. As we try to delineate, again, you're going to start to see and we're going to show some actual photos comparing where the operational areas and some linear features where there have been some improvements on the property for agricultural and land use.

Q. All right. Let's move to Area 4. What were the historical site uses there?

A. So Gulf operated producing wells starting in 1941 and two saltwater disposal wells in 1957 and 1977. Those -- all those wells were P&Aed in 1983 and 1984.

And then subsequent operators after Gulf were there, and we had that location of that shut-in well, and we're going to show that here in just a second on the drone photography.

Q. And here's the drone image of Area 4; is that right?

A. That's correct. So you see the truck just to the, I guess, left side of the truck, you'll see kind of a little pad -- not pad but just kind of an open area there. That's the shut-in well location. If you look up to the top

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of the screen, that's Area 2 and you can see the pond up there.

Q. What are the results of the salt-based sampling that was conducted in Area 4?

A. Much like Area 2, we did have one location, H-21, at the zero to 2-foot sample where ERM reported some exceedances of ESP and SAR. We then, again, like Area 2 and H-12, we went back and sampled from the zero -- at 1-foot intervals within the upper 3 feet to show the location.

So within the effective root zone, we do not show any exceedances of salt parameters at that location. We also -- the blue boxes show here the SPLP locations. And we do have a red box here and you can see a red boring location, H-16 R 2. That is part of our contingent SPLP chloride sampling plan. In order to collect an SPLP sample from the interval within the unsaturated zone with the highest EC concentrations, you know, to help with the way that the DNR has liked to see the data in the past.

Q. And is there an area on this map that Mr. Angle will address that falls immediately beneath the root zone, effective root zone?

A. Yes. So Mr. Angle will be looking at

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that H-21 and testifying to that H-21, H-21 R and basically the zero to 3-foot results that we're seeing here.

Q. So while we're on SPLP, that is an analysis and testing procedure that has been relied upon not only by LDNR and LDEQ along with other lines of evidence to show the scope and extent of cross-media transfer of chlorides? Is that right? Salt based constituents?

A. That's correct. It's one of the tools in the toolbox, but we have multiple lines of evidence through actual sample concentrations. We pulled the subsurface geology at the site, and that's just one of the tools that can be used to show that we're protective of groundwater.

Q. Summarize for us the results of barium sampling at Section 4, or Area 4.

A. So again, same sorry. This is that one I pointed out, I think when we were looking at one of the earlier photographs. You see the linear pattern or the linear line there that was taken right along that road surface. Everything, again, is contained within that zero to 2-foot sample. Low concentrations, you know, and again Ms. Levert will talk about that.

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And just the -- you're going to see here that, again, the nonconformance to the historical E&P operations versus where we're seeing some results.

Q. And next, you have the hydrocarbon fraction results in the soil at Area 4; right?

A. Correct. So when ICON had reported the mixtures, we went and took fraction data and you see we had one interval at H-15 from 6 to 8 feet where we had an aliphatic C 8 to C 10 carbon chain with an exceedance of the soil nonindustrial screening standard. Ms. Levert will discuss that.

Q. Okay. Let's move to Area 5. What were the historical uses there?

A. A dual completion well drilled by Gulf in 1964 and P&Aed in 1980. There were subsequent operators east of Area 5, and it's agricultural use, currently fallow field.

Q. Let's move to a drone image of that part of the property, if you could describe it for the panel and the judge?

A. Yeah. So that was the little area that we parked in. You see just kind of the green greenery. Really no indications of any oil field operations that we can see on here. And then

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Areas 4 and 2 are kind of up to the top part of the screen.

Q. And the results of the salt-based sampling at Area 5 were what?

A. Like Areas 2 and 4, we had one -- and we had a total of three of these locations where, when the original sampling was done, we showed something in the zero to -- either zero to 2 to zero to 4-foot intervals. So at H-18 here, we did see the same thing like we did in the other two areas. We went and resampled at 1-foot intervals from zero to 1, 1 to 2, and 2 to 3. The intervals within the effective root zone came back below regulatory standards, and Mr. Angle will continue to discuss this further.

We do have a contingent SPLP chloride sample shown here at H-18 R 2 to, again, satisfy the, you know, desire to have SPLPs at some of the higher concentrations within the unsaturated zone.

Q. And next, we have the barium soil results for Area 5. And what do they show?

A. Yeah. Again, you'll see the zero to 2 is really where everything is contained, you know, the spread.

I will point out that there's -- really

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in a lot of our data, there's discrepancy between results between what ERM and ICON reported. And again, Ms. Levert will kind of delve into that even further, but that's another important note that we observed and I think...

Q. And you have, in this area as well as in some others, proposed delineation locations in connection with barium in order to assure that you achieve full vertical delineation -- or horizontal delineation? I'm sorry.

A. Horizonal, correct. Yes. And you see that here in this H-19 in E2 up to the top-right of the Area 5 box.

Q. Next you have your fraction results for hydrocarbons in the soil at Area 5. Anything of note to you there?

A. Yes. We went back and did -- all of the fraction data came back below regulatory standards.

Q. Area 6, what were its uses?

A. Drilled in 1964 by Gulf. It was P&Aed in 1983. There were subsequent operators east of Area 6 and, again, that's where, when we were talking about earlier, you can kind of see where the water was being held. That was a subsequent

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operator outside of Chevron. And there's an impounded area that holds water and that's heavily vegetated.
Q. This is a drone image of Area 6; is that right?
A. Correct. So as we're going down that road, it's actually off to the left-hand side where the tall trees are located. Again, that area that you see kind of prominently sticks out, that's not Chevron's area.
Q. And you now have the salt-based sampling results of the soil in Area 6. What did those show?
A. So you see the yellow locations showing the original ICON location where ERM went back and sampled and we don't show any exceedances.
Q. There is one location, is there not, that Mr. Angle will address immediately beneath the root zone in that area?
A. I don't believe --
Q. There is not?
A. Not at this location, yeah.
Q. Okay.
Let's go next to the barium results in the soil. What do they show at Area 6?

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A. Once again, not to bore the panel here, but limited to the zero to 2-foot, there is discrepancy between ERM and ICON. I'll point out one example, but there's many here. H-24, zero to 2, ERM had 294, ICON had 3,490. And there's other examples as you look across all the data sets that were produced between ERM and ICON.
So that -- it's limited to that zero to 2-foot sample, and we do show here that we want to -- we're proposing some additional delineation samples. I think we have a total of seven at this location. Yeah. Or maybe eight. Eight locations, between some resamples at some locations and some delineation borings.
Q. Let's go to the last area that's subject to the limited admission area, Area 8. What were its historical uses?
A. So this well was drilled by Gulf in 1946. It was actually a dry hole, so it was P&Aed one year later, in 1947. It's heavily vegetated. It was heavily vegetated until around 2017, 2019, and it was converted to agricultural uses. It's currently an active rice field.
Q. So this is the drone image of that area; right?

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A. Yeah. If you kind of look over towards the left-hand side, you'll see the birds playing around. But it's just a beautiful green pasture, just a beautiful field, really no indication of any oil field operations. And again, you see where the row where we show those, kind of, linear features for barium that's over shown on the right-hand side of the screen.
Q. One the times you visited the site was with some of the panel members --
A. Correct.
Q. -- who are here today; right?
A. Yes.
Q. And all of you visited most, if not all, of these areas; is that right?
A. Yes. The panel members who were there, yeah, did -- have, but yes.
Q. So let's go to Area 8. What did the salt-based sampling show?
A. Yeah. No real impacts that we needed to delineate any further, and, again, we show the blue box down at H-3 where we -- which is outside of the area but where we took an SPLP sample.
Q. Then you have barium results in the soil at Area 8. What do they show?

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A. Yeah. You see -- again, that road we showed to the right-hand side of the drone we just saw, and, again, we see H-4 and how we tried to delineate but it just kept going along that linear pattern. And low concentrations confined within the zero to 2-foot area, and we are also proposing a handful of resamples and delineation borings to continue to try to delineate barium even further.
Q. So we have really two constituents, if you might call them, of concern in the soil. It's barium and also chlorides; right?
A. Correct.
Q. And you've talked a lot about the barium soil sampling results and groundwater results and also the chloride data set. So summarize for this panel and the judge, if you can, the summary of the barium sampling results.
A. Yeah. So first, there was no 29-B exceedances for true total barium. So that was -- we didn't have anything across all the data that we collected. Barium does exceed the groundwater screening standard at only one location, which was a produced water source. There was elevated barium in soil almost exclusively in that zero to 2-foot range, which you've heard me discuss.

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And then, again, the distribution of barium poorly correlates with the E&P features, and we think that's likely attributed to the reworking of the surface soils through agricultural use, construction of roads, et cetera.

And we've got these two images here showing the 1981, you can see the operational area; and then, in 2019, where you see the road. And you don't see the correlation in 1981, but you do in the 2019 data set.

And then mean exceedances of screening standard reported by ICON were not confirmed in the ERM split.

Q. And what is the summary, if you can provide that, of the sampling results for salt-based constituents?

A. I think the -- probably the headline is that we're delineated with the exception of that one location where we want to put a monitor well into Area 2 up to the north. That's the one location. But elevated chloride and groundwater was localized to the former E&P operations. And then as we did step out, there was concentrations where we did have some impacts, you see them

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rapidly decrease and decline. The chloride is -- in groundwater is delineated in each of the limited admission areas except that one area north -- north of Area 2.

The 29-B salt parameters in soil are delineated laterally and vertically in each of the limited admission areas. There was no 29-B salt parameter exceedance within the effective root zone. And we've shown multiple lines of evidence of protection of the underground source of drinking water being vertical delineation to the lab data, the EC probe logs -- again, I'll point you back to those where we did see the highest impacts as confirmed by the lab data that we quickly showed that decrease, and we confirmed that decrease with the laboratory data in the soils as well. The vertical permeability, we had three of them from 10 to the minus 7 to 10 to the minus 9 showing that it meets the definition of a natural liner, and the SP chloride data. So we've got multiple lines of evidence showing that we're protective of the Chicot Aquifer. And we've proposed sampling to complete delineation of groundwater and supplement the SPLP data.

Q. And I don't think we have a dispute with

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any of the experts either for ICON or from ERM or any of Chevron's other experts that the shallow groundwater at this property is not a USDW; is that right?

A. I would -- that is my guess. I agree.

MR. GREGOIRE: Those are all the questions I have. Thank you.

CROSS-EXAMINATION

BY MR. WIMBERLEY:

Q. Mr. Purdom, I just want to make a few things clear.

You're not the one on your team that identified the chloride and barium background concentrations in the soil and groundwater; right?

A. I'm not the one who did that; correct.

Q. And you're not the one that identified any of the AOIs according to RECAP?

A. Correct.

Q. And you're not the one who decided what the groundwater classification was?

A. I did look at that data. Mr. Angle in our team did go through that, but I was part of that discussion and reviewed that.

Q. You're relying upon Mr. Angle's opinion for that; right?

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A. Correct. But I concur with Mr. Angle's assessment that it's a GW 3.

Q. Just because there's a public water supply available, does that mean that we're not supposed to protect the groundwater under RECAP? Does that have anything to do with the definition of groundwater under RECAP?

A. Repeat the -- I'm not quite sure where you're going.

Q. The availability of the public water supply, does that play into the classification of groundwater under RECAP?

A. Well, what I'll say is this -- this -- the shallow groundwater that we do see at the surface is unusable due to its poor nature and the yield that we have. So we don't identify that there's a useable source of groundwater there at the site until you get into the Chicot Aquifer.

Q. And you're going to rely on Mr. Angle to ^sum that up?

A. Well, I agree with that. I think I've -- I've looked at that data and -- but with Mr. Angle's -- ultimately being the person who's going to opine on the groundwater classification, but I have looked at the data as well and

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completely agree that it's a GW 3.
Q. So the ground out there from zero to 30 feet, is it soil or is there an aquifer?
A. I would not consider any aquifer below, down until you get to the Chicot.
Q. Okay.
Now, the shallow groundwater stringers that you described, would you consider those hydraulically connected?
A. In some areas, there's some connection. But for the most part, as we showed on those cross-sections, you'll have borings right next to each other where there is absolutely no connection. So no, I don't determine this to be a continuous connected to groundwater zone.
Q. So they're somewhat connected but not fully connected?
A. There's areas where -- there's small areas where there is some connection, but these are really more stringers, and we've put some in the ground where there was small areas of connection. But for the most part across the facility, we even had a lot of areas where we went to go look to take groundwater samples and there was nothing there to collect or the samples, when

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we were purging, they went dry.
Q. So the various stringers out there, as you describe them, are they separate aquifers?
A. I'm not calling them aquifers. I'm calling them basically stringers of silt that have a little bit of water in them, but I don't consider them an aquifer.
Q. So it's your understanding that there are no aquifers out there below or above 120 feet?
A. There are zones where there is -- there's groundwater zones out there or groundwater stringers out there, but I do not consider that to be an actual aquifer or usable aquifer.
MR. WIMBERLEY: I think that's all I have.
(Discussion off record.)
BY MR. WIMBERLEY:
Q. And just to clarify that, you said you have made a determination that it's a Groundwater 3?
A. Yeah. Ultimately, Mr. Angle made it, but I agree with that.
Q. And how can you have a Groundwater 3 without an aquifer?
A. It's a Groundwater 3 zone, is a water-bearing zone. I'm talking about a useable

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aquifer that can be used for public consumption.
Q. So it is an aquifer?
A. It's a water-bearing zone. It's stringers of that -- of water, but I don't consider that to be an aquifer.
Q. Do you understand that, under definitions in RECAP, a Groundwater 3 means it's an aquifer?
A. It follows up with that word "aquifer," but it's a water-bearing zone.
MR. WIMBERLEY: No further questions.
JUDGE PERRAULT: Any redirect?
MR. GREGOIRE: None.
JUDGE PERRAULT: Do any of you have questions for this witness?
PANELIST DELMAR: Yes, Your Honor. We're kind of discussing it.
JUDGE PERRAULT: Do you need a second? Take a second.
While they're doing that, I want it make it clear. Let's see. Exhibit 1.7, which was the curriculum vitae, was there any objection to that being admitted into evidence?
MR. CARMOUCHE: No. No objections.
MR. GREGOIRE: Judge, just for clarity on the

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record, Mr. Purdom referred to several of the attachments and appendices in the proposed most feasible plan. So with that being said, Chevron files and offers Chevron Exhibit No. 1, which is its proposed feasible plan and attachments. In addition to Chevron 147, which is his CV, Chevron 45, which is RECAP that Mr. Purdom referred to in his testimony, and Chevron 46, which is 29-B.
MR. WIMBERLEY: Can you state the one right before 29-B?
MR. GREGOIRE: RECAP, Chevron 45.
JUDGE PERRAULT: So you're offering Exhibit 145 and 46, and we've already done 1.7?
MR. GREGOIRE: Yes, Your Honor.
JUDGE PERRAULT: Any objection to Exhibit 1, Exhibit 45 or Exhibit 46?
MR. CARMOUCHE: No, Your Honor.
JUDGE PERRAULT: No objections. So ordered. They shall be admitted.
MR. GREGOIRE: Just for clarity, I didn't hear that. Some folks said you may have said "1.47." It's 147 is Mr. Purdom's CV.
JUDGE PERRAULT: So it's not 1. -- it's 147?

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MR. GREGOIRE: Yes.
JUDGE PERRAULT: So Exhibit 147, Mr. Purdom's curriculum vitae, is admitted into evidence without objection.
Thank you for correcting that.
JUDGE PERRAULT: Is the panel ready?
PANELIST DELMAR: Yes, Your Honor.
JUDGE PERRAULT: Who wants to go first?
PANELIST DELMAR: I will. Chris Delmar.
JUDGE PERRAULT: Okay. Please proceed.
PANELIST DELMAR: So I have a couple of questions about the cross-section -- well, I have a question about the cross-section as well as some of the potentiometric surface data that was measured.
So for the cross-section locations, you have the A to A prime. It has a nice east to west look, trend until about H-3 and then it makes this big sort of north-south dog leg.
Could you explain why y'all decided to make that sort of track?
THE WITNESS: Really, we wanted to really just capture all of the data that was right over there in that background. So it was just to capture more area. So it was -- we

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could have cut it off at -- I think it was H-32 A and B where we had, so we could have cut it off at that point, but we were right there with those other two, so we just let it jut down.
PANELIST DELMAR: Also, between H-3 and H-32, are there any other sample points there, any logs available that could have given some more information? Judging by the scale, it's about 2500 to 3,000 feet of just here's one spot, here's the other one, here's the next.
THE WITNESS: Yeah. So we did look at the deeper borings to try to get the most indication. There were some more borings, but they just didn't have the depth to really provide a whole lot of detail that really meant anything. All of our boring logs are included in our expert reports and so we've produced that, so they're there and available, but there wasn't any, you know, real reason why we didn't include those, other than they just really provide the depth information.
PANELIST DELMAR: And the cross-section for C and D, those are in the MFP?

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THE WITNESS: Correct.
PANELIST DELMAR: The figures? Okay.
They weren't in the presentation. I just wanted to make sure.
THE WITNESS: Right. Just for the time and consideration, we just wanted to have those couple in there.
PANELIST DELMAR: Also, do you -- I'm going to jump around a little bit on my questions. But do you know the depth of the Bayou Lacassine?
THE WITNESS: Yes. We did measure that. I believe it's 10 feet was the depth to the bottom.
PANELIST DELMAR: Okay.
And I do have one question about, again, the potentiometric surface on H-10. When you had it measured, most of the wells in the area were 1 foot or minus 1 foot below sea level. This one was minus 5. So there's obviously a very significant difference between that. Was water removed before the sampling? Like was it -- because I'm assuming no one's pumping from this monitoring well?

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THE WITNESS: Right.
PANELIST DELMAR: So I don't assume it's a pumping center. But what caused that sort of draw-down at that spot?
THE WITNESS: Which well was that? Was that the one over towards the far east?
PANELIST DELMAR: H-10.
THE WITNESS: So no. We never -- the first thing we do when we go out to take the water levels is that's our first activity, so no draw-down, no type of pumping or sampling is occurring prior to that water level being collected.
PANELIST DELMAR: So just sort of minus -- just negative 5 feet is kind of anomalous, "something happened and you don't know what" kind of thing?
THE WITNESS: Well, it could be the stratigraphy down below. That may be the one where there's a little more sandy zone to it. So I believe that may be part of the explanation there.
PANELIST DELMAR: And my last question, referring to the chloride in groundwater slide, the background value that you placed

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at the bottom of the slides was 687 milligrams per liter.
THE WITNESS: Correct.
PANELIST DELMAR: And I'm looking at the background values in Area 1 and Area 9. And all of those are lower than 687. So how did you calculate background for that?
THE WITNESS: Yeah, so that was done by -- within our ERM team using the ProUCL software, and Ms. Levert would have to go into a little bit more detail on how that was done, but that was done through ProUCL.
JUDGE PERRAULT: Anyone else have a question?
PANELIST OLIVIER: I think we're good. Thank you.
MR. CARTER: Our next witness is Patrick Ritchie.
JUDGE PERRAULT: Do y'all want to take a ten-minute break?
Any objection? We're going to take a ten-minute break, and then we'll come back with your next witness.
We'll go off the record.
(Recess taken at 10:45 a.m. Back on record at 10:58 a.m.)

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JUDGE PERRAULT: We're back on the record. It's now 10:58. I'm Charles Perrault. We're conducting a hearing, Docket No. 2022-6003. Chevron's presenting its case, and it has its second witness.
MR. CARTER: Yes. Chevron calls Patrick Ritchie.
JUDGE PERRAULT: Come forward, sir.
Please state your name for the record.
THE WITNESS: Patrick R-I-T-C-H-I-E.
PATRICK RITCHIE,
having been first duly sworn, was examined and testified as follows:
DIRECT EXAMINATION
MR. CARTER: And as with Mr. Purdom, we'll provide copies of the PowerPoint presentation that will be presented with Mr. Ritchie's testimony.
JUDGE PERRAULT: State you name for the record.
MR. CARTER: I'm Johnny Carter.
BY MR. CARTER:
Q. Mr. Richie, please introduce yourself to the panel.
A. Yes. My name is Patrick Ritchie.

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Q. What do you do, Mr. Ritchie?
A. I'm an ecologist, and I work with my own company, Ritchie Ecological Environmental Services.
Q. What is your role in this case?
A. The role in this case, I have worked with Dr. Luther Holloway. We have coauthored a report. Our purpose of our study was to view the vegetation health of the site and characterize the effective root zone of the vegetation growing on the site.
Q. What is your educational background?
A. I have a bachelor's degree in ecology and evolutionary biology from Tulane University. I also have a master's degree from University of Florida College of Agriculture and Life Sciences in soil and water science.
Q. Do you have professional certifications?
A. I do. I have two professional certifications. The first one is a certified senior ecologist that requires ten years of experience in the field of ecology as well as education as well. Similar, the professional wetlands scientist also has requirements for education and experience, and I hold both of those

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currently.
Q. Do you have experience in evaluating effective root zones?
A. Yes. I have significant experience over the last eight to ten years working with these cases and determining effective root zone studies. I've conducted over 25 of these in one way, shape or form, all in Louisiana starting with field work, conducting the field work, also helping with producing any of the documents that go into the report and writing and altering my own effective root zone determinations as well.
Q. How many of the effective root zone studies that you have worked on have involved agricultural land?
A. The majority of them have. In these cases, we will view the different habitats that are present at the site. And many of the sites in Louisiana have some agronomic component to it, and we've reviewed those as well.
JUDGE PERRAULT: Mr. Ritchie, please speak louder.
THE WITNESS: Yes, sir.
BY MR. CARTER:
Q. Mr. Ritchie, you coauthored the report

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with Dr. Holloway. You mentioned Dr. Holloway. Who is Dr. Holloway?
A. Dr. Luther Holloway is a Ph.D. who has done effective root zone studies for many years. He has significant experience, over 40 or 50 years of experience, and I've worked with him for many years and others that have done effective root zone studies in Louisiana, but he has since retired.
Q. Have you testified before LDNR before?
A. That is correct, I have.
Q. Which case was that?
A. That was the Newman case.
Q. What did you testify about in the Newman case?
A. It was similar to this case. I did an effective root zone study with Dr. Luther Holloway in that case, also viewing the vegetation and the different habitat types of that property as well.
Q. Have you worked with Dr. Holloway on matters where he testified to LDNR about the effective root zone?
A. Yes. We've been working together similar, in a partnership so to speak, for many years. And some of these cases that he's worked

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on most notably would be Hero Lands recently, LA Wetlands and some others, yes.
MR. CARTER: We tender Patrick Ritchie as expert in botany, agronomic and plant ecology, soils and root zone analysis.
MR. KEATING: Your Honor, Matt Keating for Henning. I don't have any questions or traverse.
JUDGE PERRAULT: Do you accept him as...
MR. KEATING: I'm not challenging the tender.
JUDGE PERRAULT: Please proceed.
MR. CARTER: We'd also like to offer and file Chevron Exhibit 5.
BY MR. CARTER:
Q. And you have a copy of that if you need to refer to it; correct, Mr. Ritchie?
A. Yes, sir.
Q. What is that, Exhibit 5?
A. This is the author -- the report that I authored with Dr. Luther Holloway.
Q. Please summarize your opinions in this matter.
A. So when doing an effective root zone study, it's very important to do a site-specific study. And so that's what Dr. Luther Holloway and

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I have done at this property. We assessed the -- surveyed the rice crops, also some trees and some herbaceous vegetation in the fallow areas of the property. We've also determined the effective root zone, and it's very shallow for this type of site, these types of soils. And the effective root zone is -- ranges between 5 and 10 inches. And in our study, we also take a tour of the site, and we look at the vegetation. And as the panel has seen in some of our aerial views and drone footage, the property is growing healthy and has robust vegetation throughout the site.
Q. So we've been using this term "effective root zone." What is an effective root zone?
A. So the effective root zone represents the portion of the plant's root system that obtains the maximum amount of nutrients and water that sustains it through its entire life cycle, through its germination all the way through its growth and reproductive cycle.
Again, it's not the deepest roots, but it is the majority of the root system.
Q. There is an illustration on this slide. What is this illustration that is on this slide?
A. So this is important for the panel to

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see and understand. So this is photographs that were taken from the soil cores from the samples that we collected in our observations. So for this sample, it's R-03, which is a rice specimen that we collected in the field.
And what you can see on the left is a collection of the photographs that we took of the core itself. And what I did was I highlighted the root systems as we saw them in the field. This is a diagram or representation. So it's not to replace all of the studies that we've done, but it's to give you an idea of what we're looking at when we determine this effective root zone. And as you can see here, there is a scale going from the surface all the way down to 2 feet, 24 inches. And what we have in this section on the right is we've removed the photographs and so you can see essentially the root system that we're reviewing while we did our study. And in this example, you can see that we've determined the effective root zone to be 5 inches. We notice that there are a couple of little de minimus roots below that, but as you can see and the panel understands, a large percentage of root systems are within that effective root zone.

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Q. How is the methodology for analyzing effective root zones and effective root zone studies, how has that been developed?
A. It's been developed over many, many years. So root zone studies are very labor-intensive, and the methods of looking at roots and root systems really hasn't changed much over the years. And what we have here is one example of one of the oldest documents that we've used as -- as one of the methods or documents that describe the methodology for conducting one of these assessments.
This one's a 1971 paper from Sherman and Genuchten. It's a Dutch paper, and it's been supplemented with multiple iterations of new studies and new types of papers and peer-reviewed papers that all have consistent methodology similar to what we have used in this site.
Q. What are the methods that you find in the literature for studying effective root zones?
A. So for this site, we incorporated and utilized three different methods. So as the quote down at the bottom is another paper that describes methodology, it's often necessary to do multiple methods. Root systems are very complex, and the

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different vegetation types warrant multiple methods. And what we did here is we looked at three different methods: excavation, a monolith and the hand auger.
Q. Describe the excavation method.
A. The excavation is simply what it sounds like: We get out there with some shovels and hand tools and we excavate the root system. We'll go, we'll find a nice healthy tree and we will look at the root systems that are growing laterally and vertically and we'll excavate around all the major roots and follow them down if -- with depth to conduct our assessment using that method.
Q. Describe the monolith method.
A. So the monolith method is a wholesale extraction of the soil core, the vegetation, and the root system. As you can see in the photo here in the middle, we use a spade and we dig out a large chunk of soil. It's a big soil core. And what we'll do is we'll lay out that soil core, we'll cut it open and expose the root systems of the plants. So we'll follow from the surface all the way throughout that profile and expose the root systems to make our determination, as you can see in this photograph.

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Q. And describe the hand auger method.
A. And the hand auger is an additional method that we'll utilize particularly in deeper soils. I'm sure the panel has used a hand auger before. We've all gotten behind one and turned it in the soil. And what we'll do is, similar to the monoliths, is turn the hand auger, pull out a soil core, expose the roots that are present or absent in that, and make our determination based on that method as well.
Q. Did you use all of these techniques for your root zone study on the Henning property?
A. Yes, we did.
Q. When did you go to the Henning property?
A. It was November, December of 2021.
Q. So how many days were you on-site on the Henning property for the effective root zone study?
A. For this study, it was a week of work.
Q. And that was in November, December?
A. Yes, sir, that's correct.
Q. How were you able to do a vegetative study in the winter?
A. There is definitely some differences in an overwinter survey than in the spring; however,

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many plant species will actually flower or grow seeds and produce in the wintertime, as some of the panel may know.
We also have evergreen species and things like that that we can observe. And then also just as far as trees and things like that go, just looking at the structure of the ecosystem, the presence of particular species, their growth habit, and just the nature of them makes it possible to do that. I've had quite a substantial experience doing overwinter surveys throughout my career.
Q. What is the effect of looking at rice in particular during that time of year in November, December time of year?
A. So what is important about this was the crop had fully developed, it had been grown and cut. So this is after the harvest of the rice. So the root zone that we're looking at postharvest is the most mature root zone that you could have in the plant. So what we're seeing is the most robust root system that this plant would have during our investigation.
Q. How much of the Henning property did you see when you visited it?

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A. We do a tour of the entirety of the site, particularly around some of the well locations that are part of this hearing today. And that's what we do, is the majority of the site, we look at it, yes, sir.
Q. What sorts of vegetation did you see on the property?
A. So what we'll try and do is get a good representation of how the land is being used with the vegetation types that we have there. So this one, we have obviously rice agricultural crop, but we also found some areas where there were trees growing. So we wanted to do an assessment of the trees as well, particularly if there was some potential for growth of trees. And also the fallow areas where you had just vegetation herbaceous shrubby vegetation growing at some of the former agricultural fields. So those were the three vegetative classes that we reviewed.
Q. What were your observations about the agricultural crop?
A. It was extremely dense, they have completed their harvest and everything up here to be similar to a fine-growing rice crop.
Q. What were your observations about the

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trees on the site?
A. So the trees, as Mr. Purdom had shown through some of those historical aerials, there was a lot of operations on-site and so the trees that we were able to find, they were either by Bayou Lacassine, but the ones that we investigated were central to the property. They were a second growth. They had mixed class of different species. And what we did is we made observations of the most dominant and oldest trees that we saw on the site.
Q. What were your observations about the herbaceous plants on-site?
A. Now, the herbaceous plants were very vigorous. And you can on in this photograph, and those panel members that have been on-site, you can see there's a wide variety of different species growing in those fallow areas.
Q. So on the next slide, what is this map showing?
A. So this is a representation of our sample locations. So we have selected three tree different species: The red maple, the sweet gum and the Chinese tallow. Of course, that is an invasive species; however, it was pretty dominant

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on-site, so it was one of ours that we selected.
The herbaceous species, we had four different species that we looked at. We had the bushy bluestem, sand spikerush, common rush and the sugarcane plume grass. And one thing notable about that, which Dr. Helen Connelly will probably discuss, those are often found in some wetlands species as well.
And then we also did rice observations as well.
So on this picture right here to the left, or the western portion of the property, those yellow dots indicate the herbaceous locations. And those were fields that were left fallow during the time of our investigation.
The central portion, those green dots indicate the three locations where we observed the trees. And then to the east and southeast, those are the blue dots that indicate where the rice observations were made.
Q. How did you select the specific locations that are shown on the map?
A. So before we go out in the field, we do a number of different things to select our locations. One thing is we'll look at historical

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aerial photos, again looking at if there are any footprints of formal operational areas or any other kind of land activity.
We'll also look at the USDA soil survey. We like to try and get a good representation of the different types of soils on-site, as soils can dictate root growth and penetration in the soils as well.
And then other things, like ICON's report or any of these areas of -- you know, where the sampling has been conducted. And what we'll do is we'll take all of that information and we'll try to get a good representation of the property and avoiding some of those constraints that I mentioned as far as former operational areas and things like that.
Q. So let's look at each type of specimen separately.
How did you measure the root zone for the rice?
A. So what we did with the rice is we did a combination of the monolith and the hand auger. So going down to 24 inches, maybe a couple inches here or there with the hand auger, but generally what we did was similar to what I had described

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previously. We extracted the rice crop, we opened up the soil core and looked at it and made our assessment of the rooting depth of this. And the effective root zone for the rice crops ranged from 5 to 7 inches.

Q. How did you measure the root zone for the trees?

A. So trees are a little bit more -- a little bit more work out there; right? So we had a number of individuals, and we all had shovels and spades and hand augers and everything else, and we went out there and excavated around all of these roots. What the panel can see in this photograph, we spray-painted the roots bright yellow so that you could see where the roots go. So we follow those major roots, and we dig around them and then find if there's any roots that are descending in the profile, we'll dig and follow those as well, and we'll make our assessment based on those excavations. And for this site, we had effective root zone between 5 and 10 inches for the different trees.

Q. And how did you measure the effective root zones for the herbaceous plants?

A. Herbaceous is the exact same methodology

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as the rice. We extracted the monolith, also did hand augers below it. And as you can see on the right-hand side, we were able to cut the core open, view the root systems as they were growing in situ on the site, and we had an effective root zone between 5 and 9 inches.

Q. Well, let's summarize your opinions in the case. What is your first opinion?

A. So the assessment started with a general tour of the site. So we went to these former operational areas. And we look at vegetation. We try and look and find any of these indications that there has been impacts to the vegetation, which there were none.

The wide variety of species that we saw on-site were productive and growing and had no visible signs of impacts from any of the E&P operations.

Q. What is your second opinion?

A. The next opinion has to deal with the soil. So again, root zone studies are specific to the soil types. Again, the soil types that we have here are silty clay with some real heavy clay. If you went and got a shovel out there and you pulled that monolith out, they call it heavy

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clays for a reason. It's pretty heavy. And so, because of that clay content, it's naturally flooded. A lot of those areas were flooded, which makes it perfect for rice cultivation.

Q. And what is your third opinion in the case?

A. The third one deals with remediation. So the purpose of the effective root zone is to provide additional insight or additional parameter to Mr. Angle and others that will -- the panel to determine what remediation depth is necessary for the growth of vegetation.

So we highlighted that the effective root zone is quite shallow in this case and that anything beyond that, for the growth of vegetation, is unnecessary.

MR. CARTER: Thank you for your time. We pass the witness.

JUDGE PERRAULT: Any cross?

MR. KEATING: Yes, Your Honor.

CROSS-EXAMINATION

BY MR. KEATING:

Q. Judge Perrault, panel members, Mr. Ritchie, Matt Keating for Henning Management LLC.

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Mr. Ritchie, do you recall I took your deposition in this case a few months back?

A. Yes, sir. You feeling better now?

Q. I am. Thank you.

I just want to clarify a few things with regard to this particular property and what your knowledge or experience may be relative to the property. Okay?

A. Yes, sir.

Q. You've never done any rice farming; correct?

A. I am not a rice farmer.

Q. And you've never done any sugarcane farming; correct?

A. No.

Q. You aren't offering any opinions about whether or not this property is suitable for rice or sugarcane farming; true? That would be outside your expertise?

A. I think that my opinion deals with the remediation depth for the rice or the growth of rice, so I don't think that is a correct statement.

Q. Okay. So you believe that you are competent to say that this property right now is

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suitable for growing rice?
A. It's growing rice as we speak, so I believe that that is a positive statement.
Q. Are you aware that the district court judge has ordered that, based on Chevron's admission, the Henning property is not suitable for its intended uses?
A. I've reviewed the order, but again, that's legal determination; so as a scientist, I'm looking at the site itself and making my determination based on the data that I collected.
Q. So you're choosing to not consider and, in fact, ignore the district court's order?
A. That's not necessarily what I'm doing as far as the legal interpretations and things like that. That would be for an attorney or someone else to handle. My purpose or scope of my work is to provide the information for the panel and others to determine those results.
Q. You're not asking these panel members to ignore the district court's order, are you?
A. No. Again, my scope is based on the study that I did as far as determining effective root zone.
Q. Have you ever been involved in the

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construction, maintenance, operation of any crawfish ponds?
A. No.
Q. And you're not offering opinions about whether or not this property is presently suitable for crawfish farming, are you?
A. No.
Q. You agree it's very common for farmers in South Louisiana to rotate between rice farming and crawfish farming?
A. Yes.
Q. Have you ever been involved in preparing and maintaining rice fields for duck hunting?
A. No.
Q. You're not offering any opinions about whether or not this property is suitable for duck hunting, are you?
A. No.
Q. Have you ever constructed or maintained a stocked fishing pond?
A. I have not.
Q. Have you ever been involved in seeding the below-water surface structure of a stocked fishing pond?
A. No, I have not.

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Q. You're not offering any opinions about whether or not this property is suitable for stocked fishing ponds right now, are you?
A. I'm not opining on that.
Q. Are you experienced in residential or commercial building construction?
A. I have experience with site assessments, permitting for commercial and industrial facilities. I do have that experience.
Q. Okay. Did you do any determination in this case whether this property was presently suitable for residential or commercial development, be it warehouses, rice drying operations or even a residential subdivision?
A. No. That is not part of my...
Q. So you're not offering any opinions about whether the property is or is not suitable for those things?
A. No. That's outside of my scope.
Q. When I deposed you back in August, you said that you had not read the Henning Management corporate deposition; correct?
A. That's correct.
Q. Have you since read it?
A. Yes, I have.

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Q. So, to be fair, you did not take into consideration what Mr. Henning's potential future uses of the property are in your analysis; true?
A. In the report, no.
Q. Okay. And the only portion of the most feasible plan proposed by Chevron that you authored is essentially opining on the effective root zone and attaching your report; correct?
A. That is a correct statement.
Q. Your determination of the effective root zone of this property is limited to whatever vegetation is currently on the property; right?
A. Yes. But it is also suitable for -- with my experience, for other vegetative uses as well.
Q. That's outside the scope of your report and your opinions in this case, is it not?
A. We did not reference any other sites in my report.
Q. Okay. You'd agree that there are many other potential future uses of this property that have nothing to do with the effective root zone; correct?
A. That's correct.
Q. Okay.

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And any issues relative to contamination, whether there is or is not contamination on the property, is outside of your area today; correct?

A. I have not opined on contamination.

Q. Okay. Your opinions with regard to effective root zone have no bearing on any groundwater -- whether or not any groundwater remediation is required; true?

A. No. I don't have any opinions on groundwater.

Q. You agree some crops are more salt-tolerant than others?

A. I agree with that.

Q. You agree that when you have an EC, or electrical conductivity which Mr. Purdom talked about earlier, above 3 millimhos per centimeter, your rice crops can have a reduction in yield?

A. There has been published studies that have that as a threshold; however, there are site-specific things that could have differences.

Q. But that's a peer-reviewed published standard that generally is applied?

A. Yes.

Q. Okay. Similarly, when you have EC above

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1.7 millimhos per centimeter, sugarcane crops can have a reduction in yield; true?

A. That's true. And as far as literature, I've also seen literature that has numbers that are greater than that. And some of my experience in sugarcane has countered to that number as well. And that's what I'm basically saying, is that I have experience with other sites that have had similar crops grown and those numbers are not a hard and fast rule.

Q. Okay.

Can you cite to any publications that say otherwise?

A. Off the top of my head, I'd have to go back and look at some of my other references, but there -- I do have some.

Q. Do you agree that when you have EC above 1.0 millimhos per centimeter, soybean crops can have a reduction in yield; correct?

A. I don't believe that's true.

Q. The same publications that you acknowledged with regard to 3.0 for rice and 1.7 for sugarcane say 1.0 for soybean but you disagree on the soybean?

A. Well, again, we're looking at

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publications. There's a number of publications that give a variety of ranges of thresholds. So for me to just tell the panel that this is a number that you need to look at, there is a wide variety of studies and things like that and that's why site-specific information is probably important.

So for my experience, there is healthy rice growing on-site, is where I would defer to my opinions in this case.

Q. You didn't undertake to evaluate the salt tolerance of the various vegetation on this property, did you?

A. No.

Q. All you did was an effective root zone analysis; correct?

A. That's correct. I did not do that analysis.

Q. You coauthored this report with Dr. Luther Holloway; correct?

A. Yes, sir.

Q. Is Dr. Holloway kind of a mentor of yours?

A. He has been for years, with many others.

Q. And he's, as you stated earlier

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candidly -- you and I are both a little younger -- more experienced at doing root studies at this point in your career; true?

A. I've probably done -- I'm not sure the exact number he's done, but as far as the ones here in Louisiana, I've probably conducted work with him on almost all of them other than, you know, maybe a handful of them. So the last ten years, I've worked on almost all of the ones he's worked on in Louisiana.

Q. And he had another 30 or 40 years before that on his own?

A. Well, yes; correct.

Q. You ultimately determined that the root zone to be considered for any soil excavation on this property is 12 inches; correct?

A. For the growth of vegetation, yes.

Q. Okay.

You previously told me when I took your deposition that you did not do any work on the Litel case, the Litel property; correct?

A. That is correct.

Q. Since I took your deposition back in August, have you looked into the Litel matter at all?

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A. Yes, I have.
Q. You would agree with me, then, that the Litel property is located about 3 miles from the Henning property?
A. Yes.
Q. Are you aware that Dr. Holloway determined the effective root zone on the Litel property, a rice farm less than 3 miles from the Henning property, to be 24 inches?
A. So at the time, I didn't know how to answer that question, but I do now. The rice growing on the Litel property had an effective root zone ranging from 5 to 11 inches. So the deepest effective root zone for the rice was 11 inches on that site.
Q. You're aware, though, that Dr. Holloway recommended soil excavation down to 24 inches, which is twice what you're recommending in this case; correct?
A. Yes. And again, to the panel's understanding, is that we will give a recommendation based on a wide variety of vegetation. There was some vegetation that Dr. Holloway viewed on the Litel property that was not present at the Henning property.

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Q. You previously told me that you had not done any work on East White Lake, or Vermilion Parish School Board case; correct?
A. That's incorrect.
Q. You have done with work on it?
A. East White Lake? Yes.
Q. Okay. Do you recall when I previously asked you if you were aware of how deep the soil excavation had gone at the south tank battery B pit?
A. No. That is the portion that I did not have any participation in, yes.
Q. You're aware that ERM, your company, recommended soil excavation only down to 24 inches at the south tank battery B pit when they came to this LDNR?
A. Again, I think my answer's the same. I don't recall or have knowledge of what those decisions were.
Q. Are you aware or are you not aware that Chevron has now been required to excavate soil down to 8 feet at that location?
A. I have no knowledge of that project anymore.
Q. Are you familiar with the AgriSouth

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matter that came before this LDNR panel?
A. I am aware of that, yes.
Q. You're aware, then, that the root zone was determined to be 8 feet on that property?
A. So in reading that, there was a couple different things with that. They looked at a total rooting depth as opposed to an effective root zone, and there was also -- rooting depth was not 8 feet, as I recall. It was less than that.
Q. Do you recall that for certain?
A. As I sit here today, I believe that was what I had read.
Q. Okay. It was significantly more than 12 inches, was it not?
A. It was greater than 12 inches.
Q. Do you recall, when you visited the Henning property, seeing multiple live oak trees out there?
A. There were live oaks, yes.
Q. Okay.
Have you ever personally or professionally been involved in planting a live oak tree on property?
A. Yes. We actually planted one after my mom passed, for her, yes.

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Q. Are you aware that if you purchase a 10-inch-caliper live oak, for example, in a pot, that you have at least a 4-foot root ball at the moment you first plant it in the ground?
A. I don't have any knowledge of the specifics of the root ball.
Q. Okay. And certainly you would expect the roots to grow deeper with that after you plant it, assuming the tree takes?
A. Well, there's -- again, to get into the specifics of planting a tree and how the roots function after that is pretty complex. I don't know if you want to rephrase your question, maybe I can give you a better answer.
Q. Well, have you -- did you include these live oak trees on the Henning property as part of your effective root zone determination?
A. No. But in the Newman matter, we did view a live oak tree that had a similar effective rooting zone as this one, and it was also in Calcasieu Parish.
Q. A moment ago, you said it had to be very site-specific. We have the Litel property less than 3 miles away that we're going to distinguish from this one.

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What is your understanding of the typical rooting zone for a live oak tree?
A. Well, so we're asking about things that we didn't assess in this study, so I'm going to have to defer to my other experience when you ask me questions about that. So...
Q. Why didn't you assess the live oak trees on this property?
A. Because they were deer residents and they were not in the -- in, as I would say, a more native habitat of this site. So they weren't considered for that reason.
Q. They're on the property, are they not?
A. Right. But as I've discussed with the panel, when we select our locations, we have a bunch of those areas that we kind of avoid; right, because there could be some potential impacts to the rooting depth based on that.
So if it's too close to a house, we've all seen what happens to tree roots when they're too close to a house and things like that. So things like that are why we would not include a sample location like that.
Q. There was a house on the property?
A. It wasn't a house that I recall. I

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can't remember exactly what it was, but there was some reason why we did not select that location.
Q. The bottom line, Mr. Ritchie, is that your testimony is limited in this case to determining what you think the effective root zone is for the vegetation that's on this property?
A. Yes. And applicable to the vegetation that would grow normally at this site based on the types of soil conditions we have there.
Q. And certainly, you wouldn't suggest to this panel that Mr. Henning should be limited in what he wants to do with his property in the future; true?
A. I'm not opining on that.
Q. You wouldn't want to be limited on your property, would you?
A. That's a difficult question to answer because there are limitations for any property use.
Q. Legally?
A. Yes. Legally, yes. As long as it's legal, yes.
Q. Fair enough. Thank you.
MR. CARTER: No redirect.
JUDGE PERRAULT: Does the panel have any

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questions? None?
You're free to go. Thank you very much.
Next witness.
MR. CARTER: Chevron calls Dr. John Frazier.
JUDGE PERRAULT: With this witness, was there an exhibit for his curriculum vitae?
MR. CARTER: That is in Chevron Exhibit 5.
JUDGE PERRAULT: Any objection -- are you offering Exhibit 5 into evidence?
MR. CARTER: Yes.
JUDGE PERRAULT: Any objection to Exhibit 5 being admitted into evidence?
MR. KEATING: No objection.
JUDGE PERRAULT: No objection. It shall be admitted.
JUDGE PERRAULT: Doctor, please state your name for the record.
THE WITNESS: John Ronald Frazier.

JOHN FRAZIER,

having been first duly sworn, was examined and testified as follows:
JUDGE PERRAULT: Do we have any documents?
MR. CARTER: Yes. We have a PowerPoint as well for Dr. Frazier.
JUDGE PERRAULT: Thank you. Please proceed.

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DIRECT EXAMINATION

BY MR. CARTER:
Q. Please introduce yourself to the panel.
A. My name is John R. Frazier. I'm a health physicist.
JUDGE PERRAULT: Please speak much louder.
THE WITNESS: Oh. I've got my hearing aids in because I can't hear very good; but because of that, I think I'm talking loud.
JUDGE PERRAULT: You're doing great right now.
THE WITNESS: Okay. I will talk louder, then.
A. Yes. My background, I have a bachelor's of arts in physics. That's because I had to take a language and that's what gives you the arts thing. At Berea College. That's a small liberal arts school in central Kentucky. I also have a master's degree in physics from the University of Tennessee and a Ph.D. in physics from University of Tennessee with an emphasis in health physics or radiation protection. I did my research at Oak Ridge National Laboratory, and that's sort of my educational background.
BY MR. CARTER:

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Q. Do you have any professional certifications?
A. Yes. I'm a certified health physicist. That's the only organization that certifies it, is the American Board of Health Physics. I achieved certification. The tests are a lot like a professional engineer or something like that. I achieved certification in 1981. And every four years, you've got to recertify. And so I'm recertified through 2025, I think it is.
Q. Have you received any professional recognitions?
A. Yes. I'm -- I was elected member of the National Council on Radiation Protection & Measurements for 12 years and worked on several committees writing reports for the NCRP.
The NCRP is an organization chartered by Congress to advise the president and the Congress on -- and the public on matters relating to radiation protection and measurements.
I was then elected as a distinguished emeritus member of the NCRP, which I now serve. Our meeting is coming up in March in Bethesda.
Q. What is your experience with assessing radiation at oil field sites?

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A. Several years. More like about 25 years or so at oil field sites. Experienced both in terms of making the measurements themselves of radiation levels and then analyzing or evaluating radiological data for environmental samples like water and soil and vegetation over, I think, about -- it lasted more than 25 years.
Q. How many times you have assessed radiation in oil field sites in Louisiana?
A. Wow. I was discussing this with my wife, and I said I don't know how many times, but there have been many. And I said probably more than 50. And my wife said, no, it's been more than 100. So it's somewhere probably in that range. It's lots of sites.
Q. Have you been accepted as an expert in courts in Louisiana?
A. Yes, I have. Both in federal and state courts.
Q. How many times have you been accepted as an expert in courts in Louisiana?
A. Well, for testifying, I've never really counted it exactly, but I'd say probably over ten times.
Q. In what sorts of cases in Louisiana have

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you been an expert in?
A. Several of the cases have been the legacy claims of NORM-impacted soil or water or equipment, and several of the cases were associated with personal injury claims. I do external -- I do not -- external, but I do radiation dose assessments, external and internal.
MR. CARTER: I'd like to tender Dr. Frazier as an expert in the areas of health physics, radiation safety, soil and groundwater radioactivity, and radiation dose assessment.
MR. KEATING: No objection.
JUDGE PERRAULT: No objection. He shall be admitted as an expert.
BY MR. CARTER:
Q. And Dr. Frazier, did you prepare a report in this matter?
A. Yes, I did. I brought along a copy.
Q. So yes, I'd like to file and offer Dr. Frazier's expert report, which is Exhibit 3, Chevron Exhibit 3, as well.
So -- very good.
So Dr. Frazier, let's talk about your key opinions in this matter.
Could you summarize your key opinions in

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this matter?
A. Yes. Two pieces of pipe that I found and the plaintiffs found on the site, not very long pieces of pipe that had above background gamma radiation readings. I looked at -- by -- across the site or looking to see if I had more equipment pipe on the site, but there were two pieces found and actually plaintiff had spray-painted them. So the opinion is, yeah, that pipe needs to be removed and looked to see if there's other in this location where it was.
The other thing was no indication of impacted -- NORM-impacted soil on the site. And the groundwater that had radiation -- well, excuse me. Radium levels in it above the range of background, there were three samples. They also had large amounts of dissolved solids in them, and the ratios of the -- the characteristics of the radium in the water were not characteristics you get with produced water coming up, but they were characteristics of natural radium coming from soil into the water.
Q. Were you retained in this matter around June of 2021?
A. Yes. I think it was about two weeks

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after ICON went out and did their NORM survey, I got a call from the law firm representing Chevron.
Q. So at the time you were retained, did you understand that ICON had gone out and surveyed for NORM?
A. Yes. They had observed, on behalf of the defendants with them, and they had Chevron with them, and that observer had made some notes and so they produced the notes to me, and I said, well, it looks like there's a couple of pieces of pipe out there.
Q. And then did you go out later and conduct an assessment, a survey, yourself of the Henning property for oil field NORM?
A. Yes, I did. My first response was: I like the ICON report and I agree with -- I know the guy that did it and I trust it, and I don't need to go out there. They said, no, we want you to go out there. So I went out there in June of 2022.
Q. When you went out there, did you assess the background level --
A. No. I'm sorry. I went out there in January of 2022. Sorry. Before my report. That's the key thing.

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Q. A few months after you were retained in June of 2021?
A. That's right. Right, I was out there in January of 2022.
Q. So when you went out to the Henning property, did you assess the background radiation levels of the property?
A. Yes. The external radiation background on the property, assessed that and it agreed pretty much with what ICON's representative had found. It's around about 10 microR per hour. That's the unit of external exposure rate -- over soil -- or in contact with soil even, is about 6 over the gravel roads and things. It's lower over the roads than it is over the soil. Soil has more natural radioactive materials in it, naturally.
Q. What sort of equipment did you use for your site assessment?
A. I used a gamma ray scintillation detector. Actually, I have the one with me that I used.
Q. Sure.
A. That's not coincidental. He said bring your survey meter.
It's here (indicating). It's a gamma

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radiation detector in this part of it here (indicating).
And the -- it's a scintillation detector. It sparkles when the gamma ray hits it. Some of you probably use these. And the rate meter is up above here, the high-voltage power support.
And this is the type of sound you get reading from just normal background. In this room, it's about 5 microR per hour in here. And that's from probably the materials around that we have in the room and that also includes the cosmic -- the gamma ray from cosmic rays, not photo, not light, but gamma rays from that. So that's the instrument I used.
Q. And you used that to measure the background at the site when you got there?
A. Yes. Both in terms of in the air and then I had a strap around it where I could lower it down to the ground level. And, again, I got about 10 microR per hour for the gamma readings at the meter and then on the region down at the ground.
Q. Did you conduct measurements -- you mentioned a location where ICON had found two

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pieces of pipe above background. Did you conduct measurements there too?
A. Yes, yes. And all background till you get right at the pipe, literally right at the pipe, and you go down in contact with the pipe and I was getting 70 microR per hour, and that's what ICON's representative had gotten on the two pieces of pipe. One was a few feet long, two or three feet long. The other was a little longer piece of pipe.
Q. And if we look at the next slide, can you describe where it was that ICON had found the two pieces of pipe measuring above background?
A. Yes. This is a great picture. It shows where the pile of, sort of, trash was, and it says "pipe" there.
It's east of the Limited Admission Area 5. It's my understanding even while I was there that Chevron had not operated where this pile of trash was. But within that pile of trash, there was another pipe and I surveyed all I could get to in surveying, and there was no other readings except for these two pieces. And I've seen this type of thing before at other sites, other states. You know, it's no evidence of where

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this pipe came from, but it's there now, and it should be removed.
Q. If you'll look at the next slide, what is this next slide showing?
A. Oh, this is the piece of pipe that ICON's representative Derek Pourciau, he had actually spray-painted it. And this is one of the pipes that had the elevated reading. In contact, it was 70 microR per hour, and if you come up to a meter, it's a little over a yard, above it, it was background. So it's -- you have to be right on it to find it, and it doesn't present an external dose unless you're down lying on top of it.
Q. So could the two pieces of pipe that were measured above background pose any potential risk of radium in the soil or in the groundwater?
A. Well, I measured around on the soil and so did Derek Pourciau. And no indication of anything in the soil around there. Pipe -- the scale or the NORM in pipe is usually on the inner surface that's builds up over time as scale. It's very insoluble. The only way you can get it out of the pipe is either it falls out or knock it out. And during remediation, they would take the pipe and they'll put tape on both ends and haul it

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away. But if you knock it out on the pipe, it would be down on the ground. I didn't see any evidence of that at all. And it's barium sulfate, radium barium sulfate, and it's extremely insoluble. So even if it's lying on the ground, it's not going to dissolve and go down into the groundwater.
Q. Has ERM estimated the cost of removing the pieces of pipe?
A. Yes. And I think I need to go into that business. The estimate they got from their NORM remediation folks, for two pieces of pipe -- there may be more there because they've got to survey it -- was $18,000. Once again, that was pretty high. And you've seen these types of things before. But they have to go through all the regulatory requirements, they've got to do the appropriate removal, taping up the end of the pipes, and then after it's gone, they've got to survey all the other pipe that's there and any other equipment they could remove, and then they have to survey the ground, every place it was, to see if anything fell out.
So yeah, I understand there's extra things they've got to do and they've got to

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document all of this. And in fact, they'll have to pull some soil samples at the time they do this as part of their release survey.
Q. Now, you mentioned before that you had surveyed soil at the site. Do you understand that ICON had also surveyed soil at the site?
A. Yes. And I had a copy of Derek's -- Mr. Pourciau's notes. And then I had a copy of the person who accompanied those -- the accompanied notes are in here. I actually made more notes than this little paragraph here. It's in my report. There's a few pages of notes, but yes, these are from my notes.
Q. And how did you decide which locations to survey on the Henning property for soil?
A. I started with the locations where the pipe was. Or I looked to make sure I was there. But I also surveyed any place I walked, any place I walked to see if there's any readings above background. I didn't find any above background. I found some 6 over gravel and about 10s -- 10 to 12 over the dirt around there, and that's all background range for Louisiana, in fact.
And so this was -- and I went by -- fortunately, by four wheelers, we rode out to some

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of these monitoring wells and while we were riding, I had the probe, the detector, suspended over the road or over the area there, and it didn't get any elevated readings.
But when we get to the monitoring wells, I would walk to them, make measurements all around that, and I even walked around this blowout pond. I'd never seen anything like that before. But yeah, I walked around that, and no readings above background there either.
Q. Did you find any elevated measurements from surveying the soil at any location on the Henning property?
A. Not from soil, no. Not at all.
Q. Did anyone take samples of the soil for laboratory testing of radionuclides?
A. No. No reason. If you don't have any elevated gamma readings, you don't need to take any soil samples, and neither did ICON collect any soil samples for RAD analysis.
Q. Now let's talk about groundwater. For that purpose, we'll go to the next slide.
Did ICON take groundwater samples to test for radium?
A. Yes. They actually collected from 28

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wells and one of the samples didn't make it to the lab or didn't get results from the lab anyway, so out of the 28, they got 27 groundwater samples from ICON. And then there were split samples of those 28. ERM didn't lose their one sample there, but they had 28 samples, but since they shipped it to -- ERM shipped theirs to Eberline. ICON shipped theirs to Pace lab. Pace lab is just west of Pittsburgh, Pennsylvania. And both of these are good labs. I've used both of them on different times. Eberline, though, does a batch split, a batch duplicate with each batch, and they had four batches. So you've got 28 plus 4 is the 32. So we had 59 analyses performed for radium-226 and radium-228.

Q. And in fact, after ICON had sent groundwater samples from a number of locations to Pace and split with Eberline, were there also some pulled from the ERM monitoring wells that were also split in the same way?

A. Yeah. That's included in the total number. The total number there is both the original ICON samples and splits and then the Eberline -- I mean the ERM's samples and splits for them.

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Q. And did you review sample results from both Pace and Eberline?

A. Yes. And I included those in two tables in my report and looked at those. And I'm sort of a data geek. I like to look at numbers. And so I included those and evaluated what they mean.

Q. In those tables in your report, there's references there to radium-226, measurements of radium-226, and measurements of radium-228. Why are those the two measurements that we're looking at?

A. I assume you're looking at page 8 of my report.

Q. We have paper copies if you'd like, because, actually, I don't have a slide with the table itself.

A. Yeah. That would be good if you had it. That way, you can see the numbers.

It's on page 8. That's the first group of samples. These are the ones ICON collected. And with the splits for ERM. And then page 9 has the monitoring wells in there.

Q. So you have described the tables that you have if your report that are on pages 8 and 9?

A. Yes.

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Q. And those tables list radium-226 and radium-228 measurements?

A. Yes. They list the result. And the standard of uncertainly there is 2-sigma calculated standard of uncertainty for each of the measurements, both of radium-226 and 228.

What I didn't list on this table but I've looked at since then was the minimal detectable concentration, what the lab says is minimum detectable concentration. I looked at that later. But I didn't put it on there. That -- details of information are in the lab reports themselves.

Q. When you look at the minimum --

JUDGE PERRAULT: Let me stop you there for a second. I just want to make it clear on the record. This page 8 and 9, what exhibit is this?

MR. CARTER: This is from Exhibit 3, Chevron Exhibit 3.

JUDGE PERRAULT: All right. Please proceed.

BY MR. CARTER:

Q. So you mentioned observing the minimum detectable concentration for each sample and the CSU, which is the standard uncertainty for each

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sample. When you looked at those, what observation did you have about the results that are shown on pages 8 and 9 from the Pace and Eberline lab data?

A. Well, there's two qualifiers that are put on radiological data, the EPA qualifiers. One, if the result is less than the minimum detectable concentration from the lab, that's considered a nondetect. If the result is less than the sum of the minimum detectable concentration and the standard of uncertainty, if it's less than that, it's qualified as a J, which means it's detected but not very reliably. Okay?

And so I looked at that for all of these 59 samples that we have here to see what those were, whether they were qualified or not.

Q. Okay. And if we look at the slide that is on the screen, the fourth bullet point down, it says 84 percent of the analyses were nondetects or J-qualified, detected but unreliable. Is that the analysis that you prepared?

A. Yes. Using the EPA's method for defining the nondetects and the J-qualified. What it means is these were just real low concentrations for that 84 percent.

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Q. The next bullet point says that from Pace, there were three samples, H-9, H-12 and H-16, that exceeded the MCL for drinking water at the tap for community water systems. Can you see that?

A. Yes, you can see that on page 8. If you look on page 8, if you look at H-9 for Pace, you see a 5.20. And if you look at H-12, for Pace, which is 20.7 for radium-226, and then if you look at H-16 which has .837 for radium-226 but it's 4.55 for radium-228 and the MCL is the sum of the two results -- or the sum of the two concentrations, radium-226 plus 228.

And so if we look at that, we see that we've got these three wells, 9 -- get the right one here. Nine, 12, and 16 that have concentrations greater than the 5 picocuries per liter. That's the MCL from US EPA for the combined radium-226 and 228.

Q. How do the Eberline results for those three samples compare to the Pace results for those three samples?

A. Well, they didn't show it, but I relied on the Pace results because if you got that much solids in it, you see Eberline, for H-9, had

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38,386. You see, for H-9, the TDS there? Got 38,386 milligrams per liter. That's a lot of solids. That's 38 grams per liter, okay? And so with that many grams per liter, they should have gotten a higher number, like Pace got. So I relied on Pace results for that. I even, in my deposition, back in August I guess it was, Mr. Wimberley deposed me. That's what I said: I relied on the Pace results.

Q. Does the measurement above the MCL, the 5 picocuries per liter in the Pace results for these three wells, indicate a potential for health effects from the groundwater at the site?

A. Well, they are greater than the MCL, and if that's -- that is for a -- MCLs are defined for community water systems, as you know, for community water systems. That's in the Safe Drinking Water Act. And it's also defined for at the tap. So by the time you get to a tap in a community water system, there's some treatment that usually goes on. And usually the treatment is to remove solids. And if you remove the solids, you remove the radium. That's the way it is; the radium is in the dissolved solids. But does it present a risk here if someone -- or a

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dose above background? In terms of calculating it, it would present one. But you've got to have someone drinking that water and you've got to have someone over periods of time drinking it.

But my experience with radium ingestion -- and not just my experience, the published data for radium ingestion says that, really, you're going to ingest hundreds of times more than the MCL for radium throughout your life before you can have an ingested radium that would cause health effects. Now, that's based upon the radium doll painters and based upon the other radium workers.

So the MCL for radium is 5 picocuries per liter. It's a very low number. And there's actually a lot of community water systems in the country that have radium higher than the MCL. They don't shut them down. They just measure it, say it's higher and then they continue using it. It's not a cut-off where you have a health effect above it or where you don't.

Q. Are there any Louisiana regulations governing oil field NORM in groundwater?

A. No.

Q. There is a figure in ICON's paper

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showing a background radium level for groundwater on the Henning property of 0.86 picocuries per liter?

A. Do you have that one?

Q. Is there a basis in the data for calculating the background level of radium on this property?

A. Well, ICON claimed to calculate the background by having five background wells and they looked at the radium-226 and the radium-228 in those five background wells. Those results are listed on table 1 on page 8. They're listed there. I forget the numbers there now. It's -- I think it's H-3, H-32 A, 32 B, 33, and 34.

But if you look at those results, they're all nondetects. If you look at the -- I didn't put it on this table. But if you look at all the minimum detectable concentrations, they were less than that. So they were all nondetects.

And so when you try to calculate an average background or a background concentration like this .86, you would need to have data that you could rely on to do that. And all these numbers are nondetects and you can't really do the mathematics on that type of thing.

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So I don't know the basis for that .86. I know what they claim it is, but the data upon which they base it is not -- those are nondetects.

Q. Has there been any testing of radionuclides in surface water on the Henning property?

A. Yes. You heard earlier about the two samples. One was 2 feet down at the blowout pond. The other was 13 feet down. And those samples were collected and analyzed. They're actually on the bottom of the table on page 9.

Q. We also see the results on the slide that is being shown as well.

A. Yeah. And all four of those results were -- the radium-226 and radium-228 were nondetects.

Q. What is your opinion about the surface water sample results?

A. Regarding radium, it's clean water.

Q. Did you assess the overall potential for health effects from radionuclides presented by the Henning property?

A. Yes.

Q. In looking at this slide, as the final slide in your presentation, what did you conclude?

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A. I just -- there's no reasonable potential for anyone on or near the property to receive a radiation dose for oil field NORM on the property greater than the range of natural background radiation doses in Louisiana. You just don't have a source that's going to give you that -- any radiation dose above the range of natural background.

Now, do you receive a radiation dose? Sure. From natural background, just like we're receiving it in this room. But being out on this site, would you get a radiation dose greater than the range of background in Louisiana? No. No scenario about what you can get there.

MR. CARTER: Thank you, Dr. Frazier. Pass the witness.

JUDGE PERRAULT: Do you want to do your cross now or after lunch? It's up to you.

MR. KEATING: I might be more efficient if I did it after lunch. I can streamline my outline based on the...

JUDGE PERRAULT: Okay. We'll take a lunch break. It's now 12:05, so we'll come back at 1:05.

(Lunch recess taken at 12:05 p.m. Back on record at 1:06 p.m.)

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JUDGE PERRAULT: We're back on the record. Today's date is February 6th. It's now 1:06. I'm Charles Perrault. We took a break for lunch, and now we're going to begin again with Dr. Frazier.

MR. GREGOIRE: Just as a matter of housekeeping, Judge Perrault. Victor Gregoire again. We want to file and offer Exhibit 18, Chevron Exhibit 18, which is drone footage that Mr. Purdom referred to earlier in his testimony. I spoke with Mr. Keating and Mr. Wimberley and they do not object to that submission.

JUDGE PERRAULT: If there's no objection, then Exhibit 18, the drone footage, will be admitted.

MR. KEATING: No objection, Your Honor. May I proceed, Your Honor?

JUDGE PERRAULT: So we're doing cross?

MR. KEATING: Yes, Your Honor.

JUDGE PERRAULT: Please proceed.

CROSS-EXAMINATION

BY MR. KEATING:

Q. Dr. Frazier, how are you doing?

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A. I'm pretty good. How are you doing?

Q. Pretty good. Did you get a good lunch?

A. It was okay.

Q. You should have come with us.

Dr. Frazier, you did not author any of the texts of Chevron's proposed most feasible plan; correct?

A. Not to my knowledge.

Q. Okay.

Your contribution to the MFP proposed by Chevron is to the extent to your which your report, which is attached to the MFP as Exhibit -- appendix R -- excuse me -- is incorporated into the overall report. Is that true?

A. That is my understanding, yes.

Q. You agree that produced water can contain radium-226 and radium-228; correct?

A. They can.

Q. And you agree that when oil and gas exploration and production activity occurs and production is being drawn from an underground geological formation that contains radium-226 and 228, that radium can and often does come to the surface with the produced water; true?

A. Yes. And the amounts vary

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significantly.
Q. And it's also your opinion that radium-226 and 228 can occur naturally in the groundwater in Louisiana without any produced water being introduced; correct?
A. I'd say, rather than say "can," it does. It's always -- if you've got solids in water, you've got radium in water.
Q. Fair enough.
When you have radium at an oil field site like this one, though, and it does come from the produced water, there are a few different places we might find it and you talked a little bit about this earlier. One place is as scale or sludge in pipe or production equipment; right?
A. That's correct, yes.
Q. And you talked about a few pieces of pipe that were located on the property. Do you recall that?
A. Yes.
Q. Another place we can find that radium can be in the soil or sediment; true?
A. You can.
Q. And --
A. You mean oil field NORM, yes, you can.

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Q. And in this case, that's not an issue; right?
A. That's correct, it's not an issue that I could find anywhere on the site.
Q. So finally, we come to the one that we're going to talk about the most, and that is radium that can be found in the groundwater; correct?
A. Yes.
Q. So to answer the question -- or let me back up.
Part of your charge in this case, Dr. Frazier, was it not, was to determine if the radium detected in the groundwater at certain of the sample locations on the Henning property is naturally occurring in the groundwater or is the result of produced water being introduced; correct?
A. Yes.
Q. Okay.
And to answer that question, one of the things you have to look at -- I believe you testified to this earlier -- is the groundwater samples and specifically the concentrations of radium-226, radium-228 and total dissolved solids

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in those groundwater samples; true?
A. That's correct, yes.
Q. Let's look at those sampling results in your report that we talked about earlier with Mr. Carter.
Can you pull up Dr. Frazier's report, page 8, table 1, please?
JUDGE PERRAULT: That's Exhibit 3; correct?
MR. KEATING: Yes; correct.
A. This is on page 8 of the handout.
BY MR. KEATING:
Q. Yes.
So Dr. Frazier, not to rehash, but generally speaking, table 1 on page 8, what that does is summarized the samples taken by ICON in March of 2020 and August of 2021 with splits taken by ERM; correct?
A. Yes. Within that date range, yes.
Q. Right. And then on page 9 of your report, table 2, contains a similar summary but these are from the samples collected at the behest of ERM with splits taken by ICON later in 2021; correct?
A. Yes.
Q. And within each of those tables, we

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basically see the same thing, which is the sample ID -- I pressed the wrong button. There we go.
Sample ID here, which corresponds to those locations we looked at on the maps earlier; right?
A. Yes.
Q. And then you have radium-226, radium-228, and then total dissolved solids here; correct?
A. Yes.
Q. And same for the Pace results; right?
A. Yes.
Q. And you've got your result listed for each one?
I'm not very good at this.
And then your -- I'm going to call it cone of uncertainty like they do for the hurricanes here.
A. Calculated standard of uncertainty.
Q. There you go.
And we see the same thing across both the Eberline and Pace results; right?
A. Yes.
Q. And without looking at it, table 2 essentially shows you the same thing; right?

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A. Same column headings, yes.
Q. Same column headings and rows --
A. And information, yeah.
Q. Other than the sample ID locations?
A. Yes.
Q. All right.
The radium samples that we see both for Eberline and Pace, those are measured in picocuries per liter; correct?
A. That is correct, yes.
Q. And then the total dissolved solid sample results are measured in milligrams per liter; right?
A. Yes. As shown on the table there.
Q. Yes, sir.
Now, TDS, or total dissolved solids, is made up of, among other things, chlorides; right?
A. Yes. And as you get to higher concentrations of TDS, the chlorides are somewhere between 50 and 60 percent of the TDS.
Q. So chlorides are a big driver of TDS when you see it in groundwater like this; right?
A. Yes. Especially as you get into higher concentrations of TDS.
Q. You talked about earlier about how the

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ICON samples were sent to the Pace lab and the ERM samples were sent to the Eberline lab; true?
A. Yes, that's correct.
Q. And you acknowledge that you think they're both good labs and you think they're both reliable in the way they measured the samples; correct?
A. Yes, absolutely. Good labs.
Q. I'm sorry. And in fact, you testified that you actually relied on the Pace lab results in your analysis in this case; true?
A. Yes. Especially for these three samples with very large amounts of solids.
Q. Okay.
Can we pull up ICON's MFP, table 3? Which exhibit number is that? E-31.
Why don't you zoom in, please, on the total solids and chlorides. That's good enough for now. Okay. Thank you.
This is ICON's groundwater summary data table, which includes, among others -- and I'll zoom in before I ask you a question. I see you squinting over there.
A. Thank you.
Q. I'm doing the same thing.

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These sample ID locations, if you look at "boring ID" over here -- we'll zoom on that real quick -- some but not all of these correspond to the boring IDs we see in table 1 of your report; correct?
A. To the best of my knowledge, that's correct.
Q. Okay. So we're talking about the same locations where the samples are referenced in table 1 of your report; true?
A. Yes. This gives the depth and also the date of collection.
Q. Okay.
Now, I want to call your attention specifically to H-9 through H-12 on table 3 of ICON's plan. And if we could scroll over to total dissolved solids and chlorides, please, which is about halfway.
All right.
So that's going to be -- yeah. It's going to be the one you're on right now.
A. Yes.
Q. It's going to be here (indicating).
A. There's 32,700 and 3,320, and 63,600.
Q. And then we've got H-12 here, which is

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24,900 total dissolved solids, 11,900 chlorides; right?
A. No. The 24,900 is H-16.
Q. H-16; correct. I'm sorry.
A. And you can see these same numbers on page 8 of my report, table 1.
Q. So you agree that the total dissolved solids in H-9 were found to be 32,700 milligrams per liter, as shown on table 1 of your report and table 3 of ICON's MFP?
A. That is correct, yes.
Q. And then if we look, you'll understand why I have this pulled up now. The corresponding chlorides at H-3 are 22,300 milligrams per liter; correct?
A. No. H-9.
Q. I'm sorry. I hashed the wrong one on my page here. Yes, H-9; correct?
A. Yes.
Q. And so at H-9, we see that the chlorides make up the majority of the total dissolved solids we see; right?
A. More than half; that's correct. Probably close to 60 percent.
Q. And that tracks with what you were

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saying earlier; correct?
A. Yes.
Q. Especially when you get in these higher concentrations, the concentration of total dissolved solids is driven in large part by chlorides?
A. Yes. The fraction -- as you get to high TDS, fraction is pretty close to the same.
Q. Now, looking at H-12, we see -- and I'll refer you to table 1 of your report first -- total dissolved solids are 63,600; correct?
A. Yes, that's correct.
Q. And then if you look at ICON's table here, you see the corresponding chlorides for H-12 to be 39,200 milligrams per liter; right?
A. That's correct.
Q. So that tracks with what we just looked at for H-9 as well; right?
A. Yes.
Q. Okay.
Now, by comparison, Dr. Frazier, you agree with me that seawater from the Gulf of Mexico roughly has a chloride concentration of, on average, of about 19,000 milligrams per liter?
A. That's not -- I don't know. That's not

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my area of expertise.
Q. Okay. So assuming that would be correct, both H-9 and H-12 has higher salinity than Gulf of Mexico seawater; right?
A. If you make that assumption. I can't verify that assumption. That's not my area.
Q. Who --
A. These numbers are higher than 19,000, yes.
Q. Who would you ask about that among your group of experts?
A. I don't know.
Q. Okay.
Who should I ask?
A. I don't know.
Q. Fair enough.
Now, going back to table 1 of your report, let's look at the combined radium-226 and 228 findings at H-9 and H-12. You would agree with me, Dr. Frazier, those are the highest combined radium concentrations that we've found in these groundwater samples; true?
A. Yes, absolutely.
Q. And these are also where we found the highest chlorides and total dissolved solids in

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all these groundwater samples by a long-shot; correct?
A. As based on the chloride levels from the ICON table, yes.
Q. And you don't have any reason to dispute the chloride concentrations?
A. No. That's not my area of expertise, but that's usually what I see.
Q. You usually see that proportion of chlorides in TDS at that range?
A. Yes. As you get to higher concentrations of TDS, that's what you generally see.
Q. Again, where we see the highest TDS in chlorides by far, we also see the highest combined radium concentrations by far; true?
A. Yes.
Q. From your earlier testimony, you recall identifying that the H-9 and H-12 groundwater samples were taken near what we've referred to as the blowout pond?
A. I don't think I testified to that.
Q. Okay.
MR. KEATING: Can you pull up figure 6 from ICON's MFP, please? Zoom in on the Area 2 on

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the west side, please.
JUDGE PERRAULT: What exhibit is this from?
MR. KEATING: This is still Exhibit E.
BY MR. KEATING:
Q. Assuming this is diagrammed correctly, you see where the H-12 and H-9 locations are marked here?
A. I see H-12.
Q. H-9 right underneath it?
A. It doesn't have an arrow.
Q. I think it's just kind of blotted out.
A. Okay. That's what it appears like, yes. Just to the northwest or southwest of the blowout pond.
Q. And these are -- these locations, assuming H-9 is, in fact, in here along with H-12, which you can see, these are within Chevron's Limited Admission Area 2; correct?
A. Yes, they are.
Q. So these samples were taken within the boundaries of where Chevron has admitted; correct?
A. That's my understanding. I'm not... That's not my understanding of the total thing. Mine's just the radiological aspects. But yes, that's correct.

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Q. Looking back to table 1 of your report, page 8, going back to H-9 and H-12 that we've looked at previously, you agree with me, Dr. Frazier, that the fact that we see these increased concentrations of combined radium, by far compared to the other sample locations, where we also see these increased concentrations of total dissolved solids and chlorides, by far compared to the other sample locations, suggestive of radium from aged produced water and not naturally occurring; correct?

A. No. No. It's not. And the reason is, you look at the radium-226 concentration and the radium-228 concentration. Radium-228 halflife is 5.75 years. Okay? The radium-228's concentrations here are greater than radium-226. And once the produced water comes up from the ground, it's -- the radium-226 is no longer with the uranium parent, 238 parent, and radium-228 is no longer with their thorium 232 parent, and so the radium -- both of those radium isotopes follow their decay. Radium-226 halflife is 1600 years. Radium-228 is 5.75 years. So if it's aged produced water, the radium-228 concentration decreases relative to the radium-226. We don't

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see that here. We see concentrations approximately one to one, roughly, and that's what you would get with normal solids in Louisiana water unrelated to oil production.

Q. Dr. Frazier, I understand your analysis regarding the 226-228 ratio based on their differing half lives and separation from their parent. Not withstanding that perfect-world scenario, the bottom line is, the total dissolved solids and the chlorides you see at H-9 and H-12, those aren't naturally occurring levels?

A. I don't know where those came from, but I do know that those are higher than you'd normally find, often find in the site, the solid, the TDS and the chlorides. I'm not a chlorides specialist, but those are high concentrations of TDS. But the ratios here of the 226 and 228 do not show at all aged produce water.

Q. Dr. Frazier, you've stated that already, and I understand your point.

But you can't explain, then, why the radium concentrations, combined 226, 228, are the highest by a long-shot at these same locations where we see these extremely elevated chlorides and TDS sample concentrations that you just said

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you can't explain where they came from; true?

A. No, I didn't say I couldn't explain where it came from. I said it's not aged produced water.

The theory is if you have high chlorides, the theory is -- and it's why you have radium in water with high chlorides. The high chlorides bring the natural radium into solution in the -- from the surrounding areas.

Q. And that's true when you have chloride-impacted soil, is it not?

A. That's correct. At real high concentrations of chlorides, you have the radium coming into the solution with the water. But as soon as the chloride levels drop or as soon as the TDS drops, the radium is adsorbed on the surrounding soils. So as you go from a site where you have high chlorides to where you have lower chlorides, the radium is no longer in solution but goes on to the surrounding -- by adsorption onto surrounding materials. And that's documented on national and international publications that I've cited in my report.

Q. Dr. Frazier, you have to acknowledge that you do not consider and you completely ignore

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the likelihood that these high TDS concentrations in the groundwater and high chloride concentrations in the groundwater were caused by the introduction of produced water, whether we're talking about bottom-up or top-down?

A. The more -- I can't answer that yes or no. But I'll say the more solids you have in the water, any water, the more radium you're going to have in that water. The higher the TDS, the higher the radium is going to be.

Q. And when Mr. Wimberley took your deposition, you candidly acknowledged that you cannot rule out the possibility, if not the likelihood, that the increased concentrations of TDS in chlorides we're seeing here and the corresponding increased radium is not resultant from chloride-impacted soil as a result of the oil and gas operations by Chevron and Gulf on this property?

A. Yes. I testified yes on the -- at the deposition, and I've testified in court to that same thing.

Q. So if it came from oil field operations, it came from oil field operations; right?

A. If it did. But I don't know where the

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high TDS came from here. But I'm looking at the radiological perspective of it. And certainly the theory is that if you have higher chlorides, you're going to have more radium in the water. Higher TDS, you're going to have more radium in the water. That's why you start off with higher -- that's why you start off with radium-226 and 228 in your produced water anyway, anyway down the formation.

But when it comes up, the radiums are no longer with their parents and so they're following their respective decays. So if you look at concentrations of 226 and 228 -- and if 228 is equal or higher than the radium-226, it's no old produced water. It could be from the stuff around it, but it's not from old produced water.

Q. Dr. Frazier, that point notwithstanding, I just want to be sure the panel understands.

That does not change your answer to the previous question, that you cannot rule out and, in fact, you agree it's likely that these increased TDS in chlorides and corresponding increased radium we see at these locations is the result of chloride-impacted soils from the oil and gas operations?

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A. I can't rule it out, but I don't know where the high TDS and high chlorides come from. There's sort of a pocket of it there. As you go away from that pocket --

Q. Where the blowout well is located?

A. Can I finish my answer?

As you go away from that pocket, the TDS drops off significantly and the chlorides drop off significantly and the radium drops off significantly.

Q. Dr. Frazier, sticking with table 1 of your report -- I think you stated this earlier, but I went and checked. And the background sample locations used by ICON to determine what ICON deemed to be background for radium in the groundwater in this case were H-3, 32 A, 32 B, 33, and 34; correct?

A. That's what I testified earlier today, yes, those same five locations.

Q. And you agree that, looking at table 1, the lowest TDS concentrations of all samples in table 1 are at those exact locations?

A. I hadn't done that yet, but I'll look right now.

Q. Sure.

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A. (Reviews document.)

It sure looks like that way, yes. And hence, if you have low TDS, you have low radium.

Q. And you -- I'm sorry. I thought you were finished.

A. And indeed, the radiums on these five samples, both 226 and 228, were nondetects.

Q. So it logically follows, Dr. Frazier, does it not, that where you have locations with the lowest TDS and the lowest chlorides, which is what we see at these background locations, are appropriate locations for determining background for radium as well; true?

A. No. Not necessarily. It's like trying to determine where's the background for TDS. You've got low numbers for TDS, but you've got other numbers that are a lot higher that are not impacted -- no radium increases. There's a tremendous variation of TDS in groundwater that you find out there. And like -- trying to find the background for radium is like trying to find a background for TDS. They've chosen five wells that have low TDS in it, but -- and they've tried to calculate for radium concentration in that background, or those wells that they call

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background. But it doesn't necessarily follow. You've got such a variation of it there.

Q. Dr. Frazier, you made no attempt to determine what you thought background for radium might be for groundwater on this property; true?

A. No. Because the more TDS you have, the higher the radium you have.

Q. Dr. Frazier, neither 29-B nor RECAP directly address the thresholds for radium-226 and 228; correct?

A. Neither 29-B or RECAP, they don't address radionuclides, total.

Q. Right.

And you agree it's LDEQ's radiation protection section that governs those thresholds in groundwater in Louisiana; right?

A. I don't know what you mean by thresholds.

Q. Maximum acceptable level.

A. I'm not familiar with maximum acceptable level.

Q. You're not aware of LDEQ's regulations saying that 5.0 picocuries per liter as the threshold for groundwater medium --

A. No. No.

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Q. If that were, in fact, the case, you agree that, for every combined radium we have on this property, 226 plus 228, concentration that's above 5.0 picocuries per liter, that would be a violation of regulations?
A. That's -- there's no regulations I've ever seen for radium in groundwater from oil field production, none.
Q. Fair enough.
MR. KEATING: No further questions.
MR. CARTER: No redirect.
JUDGE PERRAULT: Does the panel have any questions?
PANELIST OLIVIER: No questions from the panel.
JUDGE PERRAULT: Thank you very much.
THE WITNESS: Thank y'all.
JUDGE PERRAULT: We have some exhibits outstanding. We have Exhibit 3. Are y'all admitting that chart?
MR. CARTER: Yes, we move for the admission of Chevron Exhibit 3.
JUDGE PERRAULT: Any objection?
MR. KEATING: No objection.
JUDGE PERRAULT: No objection. So ordered

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Exhibit 3.
JUDGE PERRAULT: Exhibit 31, is that your exhibit that they offered?
MR. CARTER: That was, I think, you guy's...
MR. KEATING: If it's a number, I think it's y'all.
MR. GROSSMAN: E-31.
JUDGE PERRAULT: Oh, it was E?
MR. KEATING: Yes. So...
JUDGE PERRAULT: E-31, so we're holding off on that?
MR. KEATING: Any objection?
JUDGE PERRAULT: And then y'all talked about Exhibit E as well?
MR. KEATING: It's a figure and table from ICON's feasible plan.
MR. CARTER: No objection.
JUDGE PERRAULT: So Exhibit 31 is admitted?
MR. KEATING: E-31.
JUDGE PERRAULT: And you talked about Exhibit E as well. Are you offering that?
MR. KEATING: I'll just go ahead and offer Exhibit E.
JUDGE PERRAULT: Any objection to Exhibit E?
MR. CARTER: No objection, Your Honor.

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JUDGE PERRAULT: No objection. So ordered. So Exhibit E is admitted.
Is E-31 part of E?
MR. KEATING: It is, Your Honor.
JUDGE PERRAULT: Okay. All right.
Call your next witness.
MR. GROSSMAN: Your Honor, Chevron calls Dr. John Kind.
JUDGE PERRAULT: All right, Doctor. Please state your name for the record.
THE WITNESS: John Kind.
JUDGE PERRAULT: Spell you last name for the record.
THE WITNESS: K-I-N-D.

DR. JOHN KIND,

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

DIRECT EXAMINATION

BY MR. GROSSMAN:
Q. Dr. Kind, how are you currently employed?
A. I work for a company called the Center for Toxicology and Environmental Health. We're a consulting firm located in Little Rock, Arkansas.
Q. What's your position there?

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JUDGE PERRAULT: Counsel, please state your name for the record.
MR. GROSSMAN: Louis Grossman for Chevron.
A. So I'm a principal toxicologist and certified industrial hygienist at CTEH.
BY MR. GROSSMAN:
Q. Could you please tell the panel what a toxicologist does?
A. Sure. We study the adverse effects of chemicals and other agents on biological systems. In this case, I'm here to talk about human toxicology.
Q. Are you also a risk assessor?
A. Yes.
Q. What kind of risk assessments do you perform?
A. Primarily human health risk assessments.
Q. And how long have you been doing that?
A. Pretty much my whole professional career of 22 years.
Q. Tell the panel a little bit about your education. Do you mind giving us that background?
A. Sure. So I got an undergraduate degree in biochemistry with an emphasis in toxicology from Murray State University in 1993 and a PH.D.

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in toxicology from the University of Georgia in 2000.
Q. So you've been working as a toxicologist for 22 years now?
A. That's correct.
Q. And what did you do at CTEH?
A. So at CTEH, I was the senior vice president of health sciences, which I stepped down from that role a couple years ago, so I do a lot less administrative work and more science now.
But one of the main things that I do and our department does is we serve as leaders of emergency response teams in the field. So I don't know if you guys have seen the headlines about the train derailment in Ohio that happened a couple days ago. We have a team up there. So both Dr. Wnek and I have been helping them kind of from the background.
So through that work, I've done a lot of different types of responses to releases all over North America. I've also worked on a lot of these types of oil field matters as well.
And then I do industrial hygiene projects and other human health risk assessment projects as well.

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Q. And you touched on this, but you've got experience working with the types of constituents that we see at the Henning property; correct?
A. Yes. Through these types of matters and also from petroleum releases. We've had responses all over the country.
Q. And you specifically performed risk assessments related to these compounds, constituents?
A. Yes.
Q. In addition to your professional work, are you a member of any professional organizations?
A. Yes.
Q. Can you tell the panel what those are?
A. Sure. I'm a member of a couple of toxicology organizations. One would be the Society of Toxicology which is really the biggest international organization related to human health toxicology. Also a member of The Toxicology Forum. Been a member of a number of industrial hygiene organizations. The American Industrial Hygiene Association is kind of biggest international industrial hygiene group. I'm a member of the oil and gas working group or

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committee for that group.
There's also the ACGIH, which is the American Conference of Governmental Industrial Hygienists. I'm a member of that organization. And as part of that, I also sit on the emergency response planning guideline committee. So we derive emergency exposure guidelines for HAZMAT incidents and things of that nature so first responders and others can take, you know -- helps guide them take protective actions and things like that.
Q. And you've also authored scientific papers?
A. Yes.
Q. Tell us a little bit more about those.
A. So I've authored a number of papers and book chapters on different areas, really in particular in relation to this, published a recent chapter on looking at risks of exposure to hydrocarbons after different types of releases.
Q. And you've been admitted to testify as an expert in both toxicology and human health risk assessment before?
A. Yes.
Q. In fact, you've been admitted as an

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expert in front of this panel; correct?
A. Yes, I have.
MR. GROSSMAN: I tender Dr. Kind as an expert in the areas of toxicology and human health risk assessment.
MR. WIMBERLEY: No objection, Your Honor.
JUDGE PERRAULT: He shall be admitted as such.
BY MR. GROSSMAN:
Q. Dr. Kind, would you tell us what you were asked to do in this matter?
A. Yes. So I was asked to evaluate the available site data and look at potential risks to human health from a toxicological standpoint.
Q. And that included the AOIs that are the subject of Chevron's limited admission?
A. Yes.
Q. And did you prepare a report setting forth your opinions?
A. I did.
MR. GROSSMAN: And that has been marked as Chevron Exhibit 4. And we'd go ahead and offer, file and introduce that into the record. And I'd note for the judge and for the panel Dr. Kind's CV is attached as

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appendix A to that report.
BY MR. GROSSMAN:
Q. Dr. Kind, you coauthored that report with Dr. Wnek; correct?
A. Yes.
Q. Would you mind telling us about the methodology you employed to perform your risk assessment?
A. Sure. So we'll get into the individual steps of this later, but from a high level, we look at all the available environmental data and then we look at potential ways that people might be exposed to those media, figure out which exposure pathways are complete, and then we calculate -- well, first, we conduct a screening using RECAP and EPA methodology to see which chemicals we might carry through the analysis. Once we do that, then we take the additional step of actually calculating dosages that the site-user might receive and we compare those not only to health-based screening values but also to toxicology benchmark values from the scientific literature.
Q. You also went out to the site; correct?
A. Yes.

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Q. And that's part of the methodology you employed in this case?
A. That is, yes.
Q. After performing that work, can you give us an idea of what your opinions are at a very high level?
A. Sure. The overall high-level opinion would be that the concentrations and the constituents in the soil on the property don't represent a risk to human health.
As part of that, we do, as I said earlier, an exposure pathway analysis. Specifically here, the groundwater exposure pathway analysis indicated that that pathway is incomplete; therefore, there's no potential for exposure of current or future users of the property to the groundwater.
We were also asked about an analysis of petroleum hydrocarbons in the soil. And our research showed -- and it's consistent with LDEQ guidance -- that the petroleum hydrocarbon fraction method in this case which was used by ERM is the most accurate and scientifically correct method for analyzing hydrocarbons for human health risk.

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And then finally, the only constituent that actually carried through the analysis was barium in soil. And when we did our dose response analysis, we did a risk characterization, we determined that that barium in soil did not represent a risk to current and future users to the property.
Q. So in your opinion, Dr. Kind, from a human health perspective, is there any need to go out and remove soil from this property?
A. No, there's not.
Q. And in your opinion as a toxicologist and human health risk assessor, is there any need to remove groundwater from this property?
A. No, there's not.
Q. Now, Dr. Kind, we're going to hear from Ms. Levert. I'd like you to explain to the panel how your analysis differs from or borrows from her analysis.
A. Sure. So here, we've got kind of definitions of toxicology risk assessment. Ms. Levert performed what we would call a regulatory risk assessment consistent with RECAP guidance to help guide what areas of the site may or may not need to be addressed or cleaned up.

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Risk assessment, as it's presented in a regulatory standpoint, is really designed to be protective of human health but not predictive of what an actual health risk might be.
Since there's uncertainty in things like strength of the study used to determine the toxicology values or species of animals used in testing or variation in human populations, there are a lot of uncertainty factors built into risk assessments.
So when you get a value, you pass screening, you know that there's not an opportunity for risk to occur. If you exceed that value, you still live in that land of safety factors, knowing that, yes, I'm above value but I don't know that if I'm at a value where an actual harm occurs. So what we have done as toxicologists is to actually calculate those doses associated with the media and the activity patterns on the site, and we've compared those not only the health protective values that you would use in risk assessment but we've also looked at the toxicology values that underlie those risk assessment values where the actual effects have been shown in the literature and made that

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comparison to determine the chances for actual health effects and risks to occur.
Q. And at the sake of being redundant, I'd like you to go ahead and explain the toxicological risk assessment methodology that you employed here.
A. Sure. So risk assessment has four basic steps, and I'll give you a quick overview of those now and we'll dig a little deeper into each of these in the presentation.
The first is hazard identification. It's looking at what's on the property, what here could be a potential chemical of concern, what has the potential to cause harm to, in this case, human populations? So you look at the data through the hazard identification.
Step two is exposure assessment. So then you're saying how might a user to this property be exposed to these constituents? Are they in the soil, water, are they in the air? And how might people come in contact with those media? That's step two.
Step three is the dose response assessment. So it's looking at those exposure levels and determining, you know, are they

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sufficient to present a risk to health.
And then step four is the risk characterization, which is combining everything together, looking at those risks, looking at the use patterns of the property to see if there is an actual opportunity for health risk there.
JUDGE PERRAULT: Doctor, please speak louder.
THE WITNESS: Okay. Sorry.
BY MR. GROSSMAN:
Q. So Dr. Kind, let's go back to step one. How did you go about identifying and quantifying the constituents on this property?
A. So what we did was we looked at the data from consultants for both the defendants and the plaintiffs and examined that whole data set.
Q. Why is it important to look at both data sets here?
A. Well, it gives us a more robust picture of what's present on the property.
Q. In your opinion, were there enough samples taken?
A. Yes, there were a lot of samples taken here.
Q. And did you look at both wet weight and dry weight?

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A. We did, yes.
Q. And why is that?
A. So to be really more comprehensive in what we did. So the RECAP regulation requires the use of wet weight concentrations for evaluating direct contact to soil. The EPA methodology uses dry weight concentrations to do the same thing. So we actually looked at both wet and dry weight when we did our analysis.
Q. So to summarize for step one, you took this massive body of data and you looked at all of those sampling results and decided which constituents needed further evaluation; is that fair?
A. That's correct.
Q. Let's talk about petroleum hydrocarbons. And I know you mentioned this earlier about TPH fractionation versus TPH mixtures. Can you tell us a little bit more about that?
A. Yes. So there's two ways to look at hydrocarbon data in the soil or groundwater. One, which ICON Environmental used in this case, is called total petroleum hydrocarbon mixture. So you've probably heard of TPH, GRO, DRO, ORO or gasoline or oil or diesel range organics. That's

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a pretty rough screening tool for looking at hydrocarbons in soil. We consider those data on a screening level.
But if you look at the RECAP regulations, regulations from other states and the EPA, they prefer a different method, which is called a TPH fractionation method. You're looking at the straight chain or aliphatic hydrocarbons on their own and you're also looking at the aromatic or ringed hydrocarbons separately. So those two have different toxicities. And instead of large ranges of hydrocarbons, you're actually breaking those down into three or four hydrocarbon chain length molecules. So you get a lot better resolution, you have toxicity factors from each of those small ranges, and you're considering both aliphatic and aromatic hydrocarbons. So it tells you a lot more about what's in the soil and it also tells you a lot more about potential risk and toxicity associated with that. So that's the methodology that we employed when we did our screenings in this case.
Q. If I'm summarizing it, fractionation data provides a lot more information than TPS mixture data; is that fair?

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A. That's correct, yes.
Q. In looking at the TPH fractions, what did you conclude?
A. So we looked at TPH fractions. There were no exceedances of the RECAP Management Option-1 nonindustrial screening standards, so we did not move those forward in our analysis.
Q. You're talking about the TPH mixtures?
A. Yes. Yes.
Q. And those exceeded RECAP MO-1 standards?
A. The mixtures did when we took it to look at the fractions -- well, there were some mixtures that did, but when we looked at the fractions, those did not exceed the standards, so we did not further those in our analysis.
Q. So there's no scientific or toxicological reason to carry forward TPH fractions for the remainder of your analysis; is that right?
A. That's correct.
Q. So with respect to constituents of potential concern, let's turn away from hydrocarbons. What other constituents did you look at?
A. Well, we looked at all the constituents,

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but that also includes a number of metals as well that were measured in the soil.
The only two that did not screen out through that process would be arsenic and barium; however, arsenic was in -- there was one -- I think one exceedance of arsenic. That was in an area that was not associated with Chevron operations. So we did not carry that through our analysis either. So barium, therefore, was the only compound that we carried through in our toxicological analysis.
Q. Arsenic, you talked about it in Area 7 right here on the slide?
A. Yes.
Q. That's not within Chevron's limited admission area; correct?
A. Correct.
Q. Did you look at chlorides?
A. Well, I mean, we looked at chlorides, but from a toxicological and scientific standpoint, those don't -- chlorides in soil do not present a risk to human health. You simply, based on the default exposure parameters for soil, you cannot ingest enough chlorides from soil to ever be a risk to human health, so we didn't carry

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that forward in our analysis either.
Q. So of all the constituents you looked at, barium was the only one that needed to be carried forward; correct?
A. Correct.
Q. Can you summarize again why that is?
A. Yes. Because barium was the only compound that -- from Chevron areas in soil that carried through the MO-1 residential screening process.
Q. And you used residential screening?
A. We did. Yes.
Q. And why is that?
A. And we'll get into this a little more later, but residential represents the most health-protective screening scenario for a given property.
Q. So going through the rest of your analysis, the next step is to look at potential exposure pathways; correct?
A. Yes.
Q. And you have it listed as exposure assessment?
A. Yes.
Q. So what pathways did you consider here?

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A. Well, we considered direct contact with soil, direct contact with water, and also the potential for consumption of wildlife on the property.
Q. Give the panel an idea of what an exposure pathway analysis looks like and how you do that.
A. Sure. So this is a little schematic that we've pulled together, but basically you have to have a source of that constituent or chemical, some type of mechanism release to the environment, then there has to be a media where that's retained or transported. So again, it could be soil, could be groundwater. Then there has to be a point of contact where a human receptor could come in contact with that media. And then there has to be an actual exposure route at that contact.
Q. So here, you looked at what sources?
A. Yeah. So here's a list of the sources that we looked at. On the left side, we have the potentially complete exposure pathways. And again, we determined that contact with soil was a complete exposure pathway, potentially, so that would be contact with soil on the skin, potential absorption through the skin, inhalation of dust

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from the soil, and also ingestion of soil.
On the other side, you'll see the incomplete pathways. Groundwater pathway is deemed incomplete based upon classification of Groundwater 3, poor natural quality and yield and the fact that there are no drinking water wells within that shallow zone on the site or within a mile of the site in the well survey.
Q. Can I stop you right there for a second, Dr. Kind?
A. Yes.
Q. What if somebody wanted water at this site?
A. Well, if somebody wanted water at this site, there are really a couple of viable options. One, the well survey that we did shows that people who complete wells for drinking water within a mile of the property complete them in the Chicot Aquifer, which I think the shallowest of those wells is about 125 feet and they go on down to 200-something feet.
The second is -- I think you've heard earlier, there's municipal water that's available throughout the site as well.
Q. And there is also a water well on this

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site completed on the Chicot; correct?
A. That is correct, yes.
Q. How did you determine whether consumption of wildlife was an exposure pathway?
A. Yeah. So we looked at the consumption of wildlife and, you know, there's really no supporting evidence that that would be a significant exposure pathway. A few reasons for that. One, when you think of wildlife, they're mobile and would move throughout the property and these areas that we're talking about represent very small geographical extent of the entire property. Some animals are migratory, like ducks and doves and things like that, so they may only spend a fraction of their lifetime on that property.
The other thing is, if you look specifically a barium, it's just not a compound that is really known to bioaccumulate in edible tissues in animals. So you look at the potential for exposure, and we deemed that that was not significant in this case.
Q. For groundwater and wildlife, you say incomplete pathways. That means what?
A. That means, again, that there's not an

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exposure pathway there, so people can't be exposed. If you can't be exposed, then there's no risk. So we did not include those in our further analysis.
Q. There's no scientific need to; correct?
A. That's correct.
Q. Now, with respect to soil exposure pathways, what scenarios did you account for there? I and know you said dermal inhalation and ingestion. But with respect to potential land uses or current land uses, what did you consider?
A. So we looked at two different exposure scenarios. One would be industrial exposure scenarios. So this would be things like farming, petroleum E&P operations, you know, anything that dealed with occupational-type exposure.
The other thing we looked at was what's called a nonindustrial exposure scenario. That relates to somebody actually having a residence and residing on that property for 24 hours a day for 350 days a year.
Q. All right. So now we have a constituent. We have barium, and we have a potential exposure pathway through soil. What's next?

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A. So the next thing is to do our dose response assessment where we actually calculate what those potential doses would be using methodology from RECAP, US EPA, and then comparing those values to those toxicology benchmarks that I discussed earlier.
Q. Could you explain for all of us the significance of dose?
A. Sure. I'm trying not to belabor the point too much, but as toxicologists, we view all substances as potentially toxic and really it's the dose that differentiate whether or not -- or on the level of dose that differentiates whether or not a given exposure will be toxic to that person. And that's really kind of the foundation and cornerstone of toxicology and also pharmacology as well.
Q. And I think some of these other slides help to explain this point a little bit better.
A. Yeah. So this is a quotation from Casarett & Doull's, which is like the handbook, textbook of toxicology. Again, if you look at the italicized text, it's really the concentration, the length of time, that's how you get your dose and it has to be sufficient to have a toxic effect

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or manifestation.
Just a quick example of a few with this concept, a couple examples. So water, you know, a quart and a half of water is safe. If you drink 15 quarters at one time, that can be lethal. Aspirin, as we all know, a couple aspirin can be safe. If you have eight aspirin at a time, you can get ringing of the ears. If you have 30, you can get a bleeding ulcer in your stomach because of the acid. If you have 90 at a time, that could be a lethal dose. Lima beans actually contain cyanide. So one helping's good, but ten cups at a time has enough cyanide to be lethal. So these are just everyday examples of a dose response.
Q. So to do your analysis of a potential dose here, what do you compare it to?
A. So in this case, we looked at a few benchmarks. One is called the reference dose, and that is a health protective value that's derived by the EPA, US EPA, that's designed to be protective of even sensitive subpopulation for daily exposure for a lifetime. So we work with that. We also look at values in the scientific literature that have been shown to be like the lowest effect level that's been seen in the

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scientific literature. So those are our main comparison benchmark points.
Q. Okay. The reference dose that you mentioned is protective, isn't it?
A. Yes. It's protective of even sensitive subpopulations.
Q. Let's talk a little bit more about reference dose. I think we have two slides here to help that explanation. We'll start with this one right here. What does this one show us?
THE WITNESS: Do you mind if I stand up and point at the screen?
JUDGE PERRAULT: Go ahead. Just speak loud.
A. Okay. I'll do that.
So this draft is what we would call a dose response curve in toxicology. So if you look at the X axis, it's the log of the dose, so as you go out on the axis, it's a higher dose. This is the percent response. So this is the percent of a population. We can say it's a population of laboratory animals. So zero precent response up to 100 percent response. This blue line is the actual measurement of this response, so when you plot dose response on a log scale, you get the S-shaped or sigmoid-shaped response.

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These dots with the vertical bars represent hypothetical data points, and that's what the curve is drawn through, those data points.
So key things to look at here, I talked about the effects levels from the literature. So this level here is called the LOAEL, this the Lowest Observable Adverse Effect Level. So that's the lowest concentration test that produced some type of effect. That's called the LOAEL. We'll talk about that in a minute.
This is the No Observed Adverse Effect Level. This is the highest dose where you don't see an effect. So when you talk about something like a reference dose or a RECAP screening value, they're based off of these LOAELs and NOAELs, and what happens is, in this case, we have an example of a NOAEL. You say all right, that's the NOAEL, this was a study in laboratory rats. So we don't know exactly how humans are going to respond compared to rats, so we're going to add a protective factor. We don't know the variability within the human population, so we're going to add another protective factor. Maybe this was a three-month study instead of a full lifetime

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study, so we're going to add another protective factor. So you add protective factors in and then finally you get your reference dose here.
So we know this reference dose is safe because we have all these safety factors in here, but we also know that it's conservative and it may not reflect the actual concentration of where that adverse health effect occurs. So we looked at both the reference doses and the LOAELs in this case for barium. If you want to go to the next slide.
Q. Yeah, I like this slide.
A. Yeah. This is actually a practical application of that. So this is a reference dose summary for a chemical called pyrene, which is a polycyclic aromatic hydrocarbon. It's actually found sometimes in aged petroleum. This is the concentration or the dose in milligrams of compound per kilogram of body weight per day. This is the LOAEL in -- in this study. This is a rat study. 125 milligrams per kilogram per day.
This is the no observed adverse affect level of 75 milligrams per kilogram a day. Now, in order to derive this reference dose, these are the protective factors that are figured in. So

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you've got ten-fold protective factor for intraspecies variability, humans to rats. Interspecies variability, variability among humans, another factor of ten for this being a sub-chronic or a weeks-long study instead of a years-long study. Another factor of three for lack of other studies, and then, if you're doing RECAP, there's another factor of ten if you're looking at the screening level of RECAP. So you end up with a dose of .003 milligrams per kilogram per day, which is thousands and thousands of times lower than the actual level that's the lowest level that's been shown to not have effects or have effects in this laboratory animal species. So there's a lot of that conservatism and health protection that's built into these values.

Q. Where do the reference doses come from?

A. The reference doses come from the EPA. They have a database called the Integrated Risk Information System where they derive and house all of these reference doses.

Q. In other words, you're not making these up?

A. That's correct.

Q. These are published?

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A. That's correct.

Q. So now we get to the last step. Step four, the risk characterization. Tell us a little bit about this.

A. Yes. So the risk characterization involves taking what we learned about the exposure concentrations and the exposure of potential pathways and uses of the property, looking at the dose response assessment, what those results indicated, and then kind of combining that all together to determine whether or not there is a potential risk to users of the property.

Q. And I believe here you mentioned that you did a very conservative analysis. Could you help the panel and the judge understand that?

A. Yes. So when we say conservative in the terms of human health risk assessment, conservative means being health-protective. So there's a few things that we did here, different levels and layers of conservatism.

The first thing we did was how we looked at the site data. So we looked at it multiple ways. So we looked at the maximum concentration of constituents on the site. So that would be from one location. We looked at the maximum

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location average. So oftentimes, there are split samples from the same location, so we would average those and look at maximum average of those. We looked at averages for the different areas of interest here, and then we also looked at what's called the 95 percent upper confidence limit, which is a statistical derivation of what the maximum, kind of, average exposure could be across that area. It's -- of all these values, it's still conservative, but it's the most realistic of the potential exposure scenarios.

Q. And so what does this chart here on the side show with industrial and residential?

A. Yes. Yeah. So as I mentioned earlier, we looked at both the industrial and residential exposure scenarios. So if you look at the left column, those are the different exposure parameters that we used, and you'll see industrial and residential on the other two columns. So the first difference there is the duration of exposure. An industrial exposure assumes 25 years of exposure. Residential can assume 30 years as an adult or six years as a child.

The frequency of exposure, for industrial, you think somebody's out there for 50

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weeks a year, five-day workweek, that's 250 days. Residential is 350 days a year.

The time is 8 hours a day for somebody who's working on a property versus 24 hours a day for someone who's living there.

The ingestion rate of soil, this is incidental ingestion of soil on the hands to the mouth is 50 milligrams per day for an industrial scenario. For a residential scenario, it's either 100 milligrams per day for adult or 200 milligrams per day for a child.

Q. In calculating doses here, did you use the child or adult scenario?

A. So we used the child scenario because that is the most conservative, the most health-protective. It assumes the greatest dose of all those scenarios.

Q. With respect to ingestion rates, did you consider soil pica? Maybe the panel doesn't know what soil pica is. Would you mind explaining what that is?

A. Yeah, sure. So these exposure values that we're dealing with, as far as exposure parameter for soil ingestion --

MR. WIMBERLEY: I'm going object, Your Honor.

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He's not discussed soil pica at all in his report, he didn't discuss soil pica anywhere in his deposition, and I'm not aware of what he's about to say.
JUDGE PERRAULT: All right.
How is this relevant?
BY MR. GROSSMAN:
Q. Dr. Kind, did you consider soil pica?
A. It's something that we consider --
MR. WIMBERLEY: I object, Your Honor.
JUDGE PERRAULT: I'm asking --
MR. GROSSMAN: Judge, it's a potential exposure scenario that they looked at and did not consider for very good reasons, and I'd like him to be able to explain that to you and the panel.
JUDGE PERRAULT: It wasn't considered?
MR. GROSSMAN: They considered it, and they ruled it out. So it's not in his report, but it's --
JUDGE PERRAULT: So if it's ruled out, how is it relevant?
MR. GROSSMAN: It's an assumption that I'd like him to speak to.
JUDGE PERRAULT: I'm asking you: How is it

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relevant if they ruled it out?
MR. GROSSMAN: I think the fact that he ruled it out and the reasons why is relevant.
JUDGE PERRAULT: We'll hear that. Go ahead.
BY MR. GROSSMAN:
Q. So explain what soil pica is and then explain to the panel why you ruled it out here.
A. Sure. So soil pica is ingestion of an unusual amount of soil. It's something that we consider when we do risk assessments, but it is a very site-specific and unique phenomenon, and typically that does not get carried forward in a risk assessment parameter.
So we used 200 milligrams per kilogram per day -- or milligrams per day. That's the EPA and RECAP default amount of soil ingestion per child. That's a very conservative value in its own right because the studies show that's really about 80 milligrams per day per child. This assumes more than that. Soil pica is an event where the scientific literature might show that a child might ingest 5,000 or 1,000 milligrams of soil in a day typically maybe once or twice a year, so it's not a common event. And that behavior is not something that is generally

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included in human health risk assessments unless there's specific reason to do so.
Q. Thank you, Dr. Kind.
So let's move to this next slide that shows two tables that are also included in Exhibit 4, which is your exhibit report.
A. Yes.
Q. Would you please explain to the panel and to the judge what these tables show?
A. Yes. If you don't mind me getting up again.
So these are tables from the expert report. They're identically set up. The difference here is the top table looks at wet weight results and the bottom table looks at dry weight results. So these, again, are this child residential scenario. Again, we mentioned barium was the only chemical that carried through. We looked at site max, site location average, the 95 UCL for Area 6 because that was the area that had the highest 95 percent UCL and the 95 percent upper confidence level for the site as a whole. Total daily intake in milligrams per kilogram a day is the dose for that child receptor based on each of these concentrations. The next column is

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that reference dose that I showed you in those couple of figures. That is the health protective value from the EPA that says it's protective of even sensitive populations for a lifetime of exposure.
Next is how many times below the reference dose the total daily intake was. So if you're below the reference dose, that means you're receiving less than that reference dose, and there's a margin of safety involved with that dose.
The next is the lowest observed affect level of 63 milligrams per kilogram per day, and then the final column is how many times that daily dose is less than the lowest observed adverse effect level.
And what you see here is that we're below the reference dose both for wet weight and for dry weight, which tells us there's a margin of safety related to potential barium exposures.
And one thing I would note as well is we did look at site max as a screening tool, but in order for this to be true, you would assume that that child spends 24 hours a day 350 days a year at that one location where that maximum was

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recorded, and that's just not a realistic scenario. So that's why I was saying that really these UCLs assume kind of an even distribution across that, either the Area 6 or the whole site, so that's a more realistic type of exposure scenario.

Q. And what these tables show, if I'm reading them correctly, is that even in the unrealistic scenario where a child is spending 350 days, 24 hours a day at the areas with the highest concentrations, they're still not even approaching the reference dose?

A. They are still less than the reference dose; correct.

Q. So what does this tell you about barium at the site?

A. Well, overall, this tells me that barium at the site does not present a risk to human health.

Q. It's below the reference dose?

A. Yes.

Q. And it's below the LOAEL?

A. That is correct.

Q. Now, we're talking about barium. And the barium that you used in your analysis, is that

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the same barium found at the site?

A. No.

Q. Explain that. Because I think the panel would be interested to hear it.

A. Yes. So this is another, kind of, level of health-protective that's built in. Barium can be found in both soluble forms in the environment and insoluble forms. Soluble forms like barium carbonate or others -- barium chloride is one you'd see in animal studies -- can actually be absorbed into the body. Okay?

Barium sulfate is what's called insoluble barium. And barium sulfate, or barite, is what was used in drilling muds to add weight to drilling muds.

So -- and it's essentially nontoxic. Again, barium sulfate is what they use as a contrast media for GI X-rays and things like that.

So the question that you ask is, you know, is the barium here that we find on legacy oil fields, is it barium sulfate? Is it barite? Is it insoluble? Is it nontoxic? Or is it barium chloride or some type of ionic form of barium? So you can do a test called XRD which actually looks at the mineralogy of the barium and can tell you

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the species it is.

In this case, XRD indicates that the barium is an insoluble form called barium, or barium sulfate. So when we do our analysis, we assume that all the barium is actually some type of bioavailable barium, that the standards we're working off of assume it's bioavailable, potentially toxic. So we've done our calculations and even assuming that it is soluble barium, again, as I just showed you, that does not present a risk to human health. But when you consider that the barium is likely insoluble, likely barium sulfate, then that just gives you an even greater margin of safety to not have concern for a risk to human health in the soil.

Q. So turning back to these two tables, 7.15 and 7.16, those are evaluating the soluble bioavailable form of barium; correct?

A. Those are considering all that barium to be bioavailable and soluble.

Q. And in your opinion, is the barium at this site bioavailable?

A. Well, I think XRD would show there's a lot of barium as barium sulfate, which would not be bioavailable.

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Q. So, Dr. Kind, in summary, can you give us the breath of your opinions in this case?

A. Sure. Again, you know, the highlighted summary is that the concentrations of constituents in the soil don't represent a risk to human health. We talked about the groundwater exposure pathway not being complete and why that was. And also, when we did our analysis, we ended up carrying barium all the way through the toxicity analysis and concluded that barium concentrations in the soil were not sufficient to cause a potential risk to users of the property.

MR. GROSSMAN: Thank you, Dr. Kind. I'll pass the witness.

CROSS-EXAMINATION

BY MR. WIMBERLEY:

Q. Dr. Kind, Todd Wimberley. I deposed you a few months ago. Do you remember?

A. Yes.

Q. First of all, do you believe that there's contamination on this property?

A. I don't know what you mean by "contamination." I think that's a legal term that gets used in these hearings.

Q. Do you believe the property is suitable

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for its intended use?
A. Again, what my analysis showed is that there's no potential risk to human health for users of the property; so in that extent, I would say yes.
Q. What's the intended use of the groundwater on this property?
A. I don't believe there is an intended use.
Q. So you believe there's no intended use for the groundwater on this property, it's not intended to be drunk, for instance?
A. I don't recall seeing mention of that. What we know from the groundwater is there is a deep well into the Chicot Aquifer on the property and there's wells in the Chicot within the area. But that's my recollection of the use of groundwater in the general region around the property.
Q. What's the intended use of the shallow groundwater on this property?
A. Again, I'm not aware that there is one.
Q. Did you do anything to figure out what the intended use was?
A. Again, I don't recall seeing any

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intended use and we're talking about a GW 3 with poor water quality, naturally poor water quality and yield, so --
Q. Did you ask Mr. Henning what his intended use was?
A. I haven't spoken to Mr. Henning.
Q. Did you do anything to investigate what the intended use of the shallow groundwater was on this property?
A. It's my understanding, based upon the analyses, that that water really is not usable water.
Q. So if Mr. Henning intends to use it to give to his grandchild, are you going to tell him he can't do it?
A. I'm not going to tell Mr. Henning anything. I'm just telling you what the science shows.
Q. Would you tell him it's unsafe?
A. Again, I wouldn't tell him what he would or wouldn't do with that groundwater.
Q. Is it safe for Mr. Henning to give the shallow groundwater to his grandchildren on a daily basis?
A. You've got high levels of iron and

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manganese in that water that render it unsafe naturally without treatment.
Q. I'm talking about the benzene and the barium.
A. Again, I've -- you know, we talked about benzene during my depo, and I told you before that I couldn't find anything in the scientific literature that showed those levels would be unsafe. And since then, I've looked at both cancer and noncancer values for benzene, and the concentration at that one location would not indicate that there would be adverse health effects if you drank that water.
MR. WIMBERLEY: So, listen now, he's telling you that he can't say it's safe to drink.
BY MR. WIMBERLEY:
Q. How many places on the property did you do the XRD analysis?
A. I did not do that myself. I think ERM did that with two of the higher barium concentration locations --
Q. Did you order the XRD analysis?
A. I don't recall doing that. I think that was maybe done before we got involved.
Q. Okay. So this whole thing you went

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through with Mr. Grossman about how you believe the barium on the property is barite and not soluble barium, this all depends on the XRD analysis; right? That's the only proof you have?
A. Well, again, you have that, combined with the knowledge that the type of barium that's used in E&P operations is barium sulfate, that's the additive that's used in drilling mud.
Q. The only testing you did to determine what type of barium was on the property was the XRD analysis that was done; correct?
A. I believe that's the only testing that was done --
Q. That only happened in two places; right?
A. Yes. Typically, in order to do that analysis, you have to have a sufficient concentration of barium in the sample to do that. So typically, you select a couple of the higher barium concentrations samples to do that analysis.
Q. And you only did it in two spots; correct?
A. Yes.
Q. Okay. You don't have any testing to show what type of barium was occurring on any other part of the property other than those two

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spots?
A. Again, you sample the highest ones, higher ones that you can find and analogize that to the others.
Q. Are you aware that there are microbes that could break down barium sulfate?
A. Not specifically. There are, obviously -- I mean, there are sulfatefate-consuming microbes, but I haven't done that specifically.
Q. Is it something that you've never studied?
A. I mean, I've studied it in general but not specifically to barium.
Q. Did you do anything to understand whether or not the microbes in this property are able to break down the barium sulphate into barium sulfide, for instance, or barium carbonate?
A. I didn't. And again, it doesn't really matter for my analysis because I assumed all the detected barium was bioavailable, so that's really not germane --
Q. That's not something you did?
A. Again, no. I took the health protective assumption that all that barium was indeed

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bioavailable, so it really doesn't matter because I assumed it was soluble, not insoluble.
Q. And you don't deny that barium sulfate can be broken down by microbes into barium sulphide or barium carbonate?
A. I told you I did not do that analysis, so I can't tell you either way.
Q. The analysis that you did was not a strictly RECAP analysis; right?
A. I did an analysis that used RECAP and EPA methodology, but I went beyond your standard RECAP analysis to actually do the toxicology assessment.
Q. And I think you and I went back and forth on this in your deposition a little bit, and, kind of, I think where we ended up was, it was there fair to say your analysis was guided by RECAP but maybe it didn't comply with each letter of the law of RECAP; is that correct? Is that fair?
A. I did not do a RECAP compliance assessment. That's what Mrs. Levert did.
Q. So you weren't bound in your assessment by each and every rule of RECAP; correct?
A. Yeah, I guess that's correct. Again, I

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used methodology from RECAP, methodology from US EPA, but I did not do a regulatory RECAP risk assessment.
Q. You were able to do what made more sense as a scientist; right? Looked at this from a science perspective?
A. Well, I looked at it from a toxicology perspective. I went beyond standard human health risk assessment and did a toxicology assessment.
Q. So if something in EPA rules or something in RECAP rules maybe didn't make sense to you as a scientist, you were free to disregard those and explain to this jury or this panel why your analysis makes sense; right?
A. I don't know what you mean by disregard. Again, I used methodology from both of those --
Q. Did you use all the RECAP methodology? Did you follow every letter of the law?
A. Again, I used the RECAP methodology that was germane to exposure parameters in calculating doses and screening and things of that nature.
Q. Did you identify AOIs in accordance with RECAP?
A. Again, I did not do that. That's something that Mrs. Levert did, who did the

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regulatory risk assessment.
Q. Can we agree that in health risk assessment the RECAP, the linchpin of the whole thing really is what's that compliance concentration or what's that concentration that we see in the ground?
A. Well, the exposure ^point concentration is certainly important but --
Q. That drives the whole boat; right?
A. Well, it's one of the factors. There's a lot of factors that go into the screening process and calculating doses --
Q. And the data points --
MR. GROSSMAN: Todd, let him finish his answers.
BY MR. WIMBERLEY:
Q. Go ahead.
A. I was just saying there are a lot of factors that go into doing that assessment and calculating that dose or screening, whichever you're doing.
Q. The data points that go into making that concentration are of paramount importance; right?
A. They are one of the important factors.
Q. And you didn't follow the RECAP rules

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about which data points go into that concentration in your analysis; correct? Because you didn't do the AOIs?
A. Well, I worked with the areas that had been established by Mrs. Levert.
Q. Which are not AOIs under RECAP; right?
A. I don't know the distinction to make ^there.
Q. So you can't sit here today and tell this panel that those areas of interest that have been identified in the ERM report are actually AOIs under RECAP?
A. What I can tell the panel is that I looked at all the data from those individual areas in my assessment.
Q. Including the data points that would be outside the AOI?
A. Well, it would depend on which way. Again, I looked at site maxes, I looked at location averages and averages for those areas. So I looked at -- again, a number of different ways to look at those -- those data.
Q. Okay.
And when you do your analysis for soil ingestion under a child scenario -- which is what

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did you; correct?
A. Yes.
Q. That's one of the analysis that you did.
What we're trying to discuss there or determine there or analyze there, how much soil a kid is going to get in its mouth if it lives there? Is that in general how you would describe that?
A. Well, there's a daily ingestion rate up to that, yes.
Q. What we're trying to measure is how many times a kid is going to go outside and get dust from the carport and go in its mouth, we're trying to figure out how much soil is going in that kid's mouth?
A. Again, that's the daily, that 200 milligrams per day ingestion rate.
Q. And that's driven by -- one of the other variables in that equation is what's the concentration that we're looking at; right?
A. Not in that equation, no.
Q. In the equation about what the dose is that the kid's getting, it's concentration times exposure equals dose; right?
A. Yes. But you were asking me if what's

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in the soil drives how much a child takes into their mouth.
Q. No. I'm not asking that. I'm asking how much dosage he gets from that soil that gets in his mouth?
A. Well, dose is a function of how much soil and the concentration of the constituent in the soil.
Q. So the higher the concentration of the soil that the kid is encountering, the higher dose they're going to get because they're eating the same amount of soil under your scenario; right?
A. Assuming the same ingestion rate.
Q. But yet -- and where's the barium on the site?
A. Barium is in the upper -- most of it's in the upper couple feet of soil.
Q. Upper 2 feet; right?
A. Yes.
Q. How many data points did you use in your concentration beneath 2 feet? All of them; right? All the way down to 50 feet?
A. Not all the way down to 50 feet, no.
Q. You didn't?
A. No. The barium data are limited to the

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top 12 feet. And like when we look at soil max, for example, that's typically in the zero to 2-foot range.
Q. You used -- you're going to dispute with me that you used all the data down to feet 15?
A. Well, so it depends. So if you're looking at the site max, for example, or max location average, those tended to be, I think, in the top 2 feet. But when you look at a UCL, RECAP says that they consider anything of 15 feet or less in depth to be surface soil, so you use that entire data set.
Q. But you weren't bound by RECAP; right?
A. Well, again, I told you I used RECAP when calculating my exposure parameters.
Q. If I'm trying to figure out how much dirt the kid is going to get in its mouth, does it make sense to look at the dirt that's 12 feet deep?
A. RECAP will tell you it does.
Q. You weren't bound by RECAP; you were bound by science and what makes sense; right?
A. Again, I used the RECAP methodology to calculate that. And when you look at soil maxes or max location averages, that gives you your

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potential highest exposure regardless of what depth that was here. It happened to be zero to 2 feet, so we still have that level of protectiveness there.
Q. But conveniently, RECAP lets you average that down with all the zeros at 10 to 12 feet?
A. RECAP says that that is how you calculate that concentration for the AOI.
Q. Speaking of the 200 milligrams a day, since you didn't talk about pica in your report or in your deposition and I don't know what you're going to say, I'm going to ask you about it.
How much soil does a pica child ingest on a daily basis?
A. Well, it's not really a daily basis. It tends to be episodic events of a couple times a year. What I've seen, the literature shows 500 to 1,000 milligrams, even maybe a couple thousand milligrams at a time.
Q. Are you talking acute pica or sub-chronic pica?
A. I think what the literature would show is that tends to happen on acute episodic bases.
Q. Do you know what RECAP has to say about pica children?

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A. I did look at that. I don't remember exactly what it says. I think it says that's a site-specific type of parameter approach.
Q. But you didn't -- so explain to me why you didn't consider pica children in your analysis.
A. Well, again, pica is something that you think about when you approach a site, but if you don't have any specific reason to include that, it's a site-specific parameter and that's typically or actually almost never included in a risk assessment unless you have reason to believe differently.
Q. So in your scenario, you didn't do it because there's no pica child living at this property?
A. Again, that's a rare event. And when we look at the soil ingestion rates that we do include, the 200 milligrams per day, that's actually about almost three times higher than what the studies show children actually consume on a daily basis. So there's, again, a protective factor built in there. So pica specifically didn't figure into that.
Q. What's the intended future use of this

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property?
A. The intended future use that I saw was more of the same, agricultural and potential recreational use as a hunting camp or fishing camp.
Q. Do you have any idea if any of Mr. Henning's children or grandchildren want to go live at this property?
A. They may or may not. But again, I did my assessment assuming that was a possibility when I did that nonresidential --
Q. You just assumed that a pica child wouldn't live there?
A. Again, pica is not a standard occurrence, so that is not a standard assumption when doing health risk assessment.
Q. So let's just get this straight. You didn't do the work to say it would be safe for a pica child to live there; is that correct?
A. Again, I didn't include that specifically in my analysis because that is not -- it's not something that is common or works its way into human health risk assessment.
MR. WIMBERLEY: Scott, will you put up Exhibit GGG 75. This is RECAP.

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Blow it up.
(Discussion off record.)
MR. WIMBERLEY: Can I put this on the Elmo? Zoom in on the acute health risk part.
BY MR. WIMBERLEY:
Q. Did you know that RECAP asks you to look at pica and possibly low its threshold based on that?
A. Again, I think pica is considered a site-specific potential, and if it's there, then you would consider it.
Q. So you would only consider it if there was a pica child there; right?
A. That would be -- that would be --
Q. Under your analysis?
A. That would be the basis for doing that. Again, as I said earlier, it may be --
Q. So we're not going to protect the future for pica children?
A. Again, that may be more of an acute toxicity issue. We're looking at chronic toxicity here. If you were to do the acute analysis, you'd find those screening values would be much higher than what they are, so... but I haven't done that, here again.

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Q. And how much did you say you used for milligrams per kilogram per day for the child or 200 milligrams --
A. It's 200 milligrams of soil per day.
Q. How much does RECAP ask you to use?
A. I don't think RECAP's asking you to use. They mention the potential of up to 25 to 60 grams per day.
Q. So that's five times 60. So what's that math? 300 times higher than what you're using?
A. It's -- I haven't done the math, but it's -- so it would be a half a gram per day, or --
Q. No. 23 to 60?
A. 200 would be --
Q. And you're using a fifth of a gram per day?
A. Would be 200.
Q. I think it's 300 times higher --
A. Yes.
Q. -- than what you assumed?
A. Again, that pica assumes a higher level. But you only use that when you have evidence that that's occurring.
Q. Since I didn't see this until you walked

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up onto the stand, I'm going to ask your colleague here: If you could pull up Slide No. 24 from his presentation on the board.
Now, you have a column here that says that your calculations show that these doses that you're assuming under your scenario are three to four to five to 14 or two to three to four to five times higher than the reference dose -- or lower than the reference dose --
A. That would be lower.
Q. -- right?
A. That would be lower.
Q. If that child ingested 300 times the amount that you're assuming in this model, those numbers would be way above the reference dose, wouldn't it?
A. Well, that would not be the right comparison because --
Q. This number would be 150 --
A. Because the reference dose is a lifetime average daily dose. Pica is an acute -- as it's said in RECAP, an acute situation, so you would make a different comparison to acute values, not a lifetime value like that.
Q. Up to 15 years; right? Under EPA

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guidance?
A. Again, pica is acute. It's not a daily dose like what we're talking about there, so it would be a different type of exposure scenario.
Q. This would be minus 150 percent?
A. Again, that would not be a valid comparison to make.
Q. But you didn't do that analysis? You didn't analyze whether the property was safe for a pica child?
A. Again, there's no evidence of pica. Pica is a rare event. It's not something that is considered in site risk assessments like this unless there's specific information related to that. So no, I did not.
Q. So under your professional opinion, making a concession or a concern or a change to your analysis to evaluate for pica children should only happen if there's a pica child on the property? Will you disregard the future and the possibility that there might be a pica child on the property in the future?
A. Again, you're looking at what the typical user of a property would be. Pica is a rare occurrence, and if you have specific

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information, you would include that. But again, that is not standard practice for a human health risk assessment, to just assume there would be a pica child in the future on the property.
MR. WIMBERLEY: Take that down, please.
Thank you.
BY MR. WIMBERLEY:
Q. You didn't analyze groundwater; correct?
A. I analyzed whether or not that exposure pathway would likely be complete, but I did not go beyond that because it was not a complete exposure pathway.
Q. You didn't do a toxicological health risk assessment on the groundwater, the quality of the groundwater as it exists in the ground, whether or not it's safe to drink?
A. Again, because that pathway was not complete.
Q. But you didn't do that; right?
A. Well, again, if the pathway's not complete, you don't carry through the next step, so I did not --
Q. I understand that you said the pathway's not complete. But you didn't do the second part of that analysis; correct?

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MR. GREGOIRE: Mr. Wimberly's going to have to let the witness speak. I've heard him interrupt the witness on at least 20 occasions, and we've tried to be flexible on it, but please let him give his answer.
A. Because the pathway was not complete, I did not proceed with that health analysis because there's no exposure; and if there's no exposure, there can be no risk.
BY MR. WIMBERLEY:
Q. You did not proceed. Okay. I think I got it there.
So you have a number of reasons you think that the groundwater pathway is incomplete. And they all look to me like kind of your present assessment of the facts. What makes you think the groundwater pathway won't be complete in the future?
A. Well, again, it's based on multiple lines of reasoning. One is there have never been drinking water wells completed in that shallow zone on the property. There aren't any in those shallow zones within a mile of the property. The water is of natural poor quality and yield. And there's already a deeper well on the property.

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There's deeper wells in the region, and there's municipal water going to the area as well.
Q. If Mr. Henning wants to drill a 50-foot well on the property, there's nothing to stop him; right?
A. Other than, again, yield and quality of the groundwater and those other factors.
Q. Well, we see there are at least ten places where we've already drilled wells at less than 50 feet that got thousands of gallons per day; right?
A. He can drill a well. But again, those factors would factor into whether or not that was a viable well.
Q. So you think it would just be unreasonable for him to drill a well?
A. Again, I'm not sure that would make sense from a water quality standpoint. People have not done that within, again, the area. It's not a regional thing. If you're drilling a well 50 feet, I don't know why you wouldn't go down another 100 feet to get to the Chicot.
Q. What if I just want to?
A. Again, you can do what you what. It's your property, but it's a matter of what makes

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sense.
Q. Is there a safe level of benzene in groundwater, drinking water?
A. From what I've seen, the EPA has an MCL of 5 micrograms per liter, which is -- which is that drinking water standard. When you look at the scientific literature, the levels that would -- well, levels that low don't cause actual harm. But again, that is a conservative health-based value related to protection of public water sources anyway.
Q. So 5 micrograms per liter?
A. That is the maximum contaminate level set by the US EPA.
MR. WIMBERLEY: I think that's all the questions I have. Thank you.
MR. GROSSMAN: No redirect, Your Honor.
JUDGE PERRAULT: Does the panel have any questions?
PANELIST OLIVIER: Can we take like a 10- or 15-minute break?
JUDGE PERRAULT: You need 10 or 15?
PANELIST OLIVIER: Ten.
JUDGE PERRAULT: Ten-minute break.
(Recess taken at 2:39 p.m. Back on record

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at 2:56 p.m.)
JUDGE PERRAULT: Today's date is February 6. It's now 2:56. I'm Charles Perrault. I had asked the panel if they had any questions for our last witness, Mr. Kind. It's my understanding y'all do not.
PANELIST OLIVIER: That's correct.
JUDGE PERRAULT: And thank you very much.
Y'all talked about Exhibit 4. Have you offered that into evidence?
MR. GROSSMAN: Yes, Your Honor. Offer, file, and introduce Exhibit 4 and including all appendices, tables, and attachments.
JUDGE PERRAULT: Any objection?
MR. WIMBERLEY: No, Your Honor.
JUDGE PERRAULT: No objection. So ordered. Exhibit 4 is admitted.
JUDGE PERRAULT: There was Exhibit GGG. Are you trying to offer that now?
MR. WIMBERLEY: It's not necessarily, Your Honor.
JUDGE PERRAULT: Okay.
All right. Call your next witness.
MR. GREGOIRE: Judge, our next witness will be Dr. Helen Connelly. Her testimony, at

least her direct, will last more than an hour. I know that this day ends at 4:00 p.m. We propose, that is, Chevron, we propose that we start her first thing in the morning. This proceeding has gone a lot more efficiently than we anticipated. We've gone over four witnesses today, but we do not want to break up her direct. So we would ask, it's at your pleasure, however you want to handle it.

JUDGE PERRAULT: I want to do whatever helps y'all present your case. Any objection to that?

MR. CARMOUCHE: I would just ask that the same rules apply, Your Honor.

JUDGE PERRAULT: I'm going to treat everybody the same. If I forget to do so, you let me know.

Any objection to that, starting in the morning?

PANELIST OLIVIER: No.

JUDGE PERRAULT: All right. We'll start at 9:00 o'clock tomorrow. And if there's nothing further, this hearing is adjourned.

(Hearing adjourned at 2:57 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

REPORTER'S CERTIFICATE

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 Monday, February 6, 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 242 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 22ND DAY OF FEBRUARY, 2023.

DIXIE VAUGHAN
Certified Court Reporter (LA)
Certified LiveNote Reporter