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.

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PUBLIC HEARING
BEFORE THE HONORABLE CHARLES PERRAULT

Taken on Thursday, February 9, 2023
DAY 4
(pages 792 through 1024)

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

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(PROCEEDINGS COMMENCING AT 9:05 A.M.)

JUDGE PERRAULT: We're on the record. Today's date is February 9th, 2023. It's now 9:05. We're in Baton Rouge, Louisiana, at the Office of the Division of Administrative Law conducting a case for the Department of Natural Resources, Office of Conservation. The case before us is Docket No. 2022-6003 in the matter of Henning Management, LLC, versus Chevron USA, Incorporated. This is our fourth day of hearings.

And today we're starting with the -- Henning presenting their plan of remediation. And I'd like the parties present to make their appearance on the record and we'll start with Chevron.

MR. GREGOIRE: Morning, Your Honor, panel members. Victor Gregoire, Chevron USA.

MR. GROSSMAN: Good morning. Louis Grossman, Chevron USA.

MR. CARTER: Johnny Carter for Chevron USA.

JUDGE PERRAULT: For Henning?

MR. CARMOUCHE: Good morning. John Carmouche on behalf of Henning Management.

JUDGE PERRAULT: And, panel, please make your appearance on the record.

PANELIST LITTLETON: Jessica Littleton, Department of Natural Resources, Office of Conservation.

PANELIST DELMAR: Christopher Delmar, Department of Natural Resources, Office of Conservation.

PANELIST OLIVIER: Stephen Olivier, Department of Natural Resources, Office of Conservation.

PANELIST BROUSSARD: Gavin Broussard, Department of Natural Resources, Office of Conservation.

JUDGE PERRAULT: All right. And call your first witness.

MR. CARMOUCHE: Your Honor, we call Mr. Greg Miller.

JUDGE PERRAULT: Please state your name for the record, sir.

THE WITNESS: Gregory Wayne Miller.

GREG MILLER,

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

DIRECT EXAMINATION

BY MR. CARMOUCHE:

Q. Good morning, panel.
Mr. Miller, why don't you tell the panel where you're from.
A. I'm from Mamou and went to school at USL in Lafayette back when it was still USL.
Q. And why don't you tell the panel a little bit about your professional history.
A. I graduated from USL in 1982. Prior to graduating and after graduating, I worked with White Wing Oil Properties doing lease evaluation and prospect evaluation for worker interest investment.
Then went to work -- after graduation and while working on my master's, which I never completed -- for Core Laboratories, and I got trained as a core and a log analyst. So I did that up until 1986 when the oil field crashed in the mid-'80s, moved up to the Northeast to Vermont and began getting trained and working in the environmental industry.
I did various, you know, contamination assessment-type activities up there, permitting, doing a lot of work with groundwater and surface water interactions. Worked with Dr. Johnson and Dr. John Cherry from Waterloo, Canada, on several

projects, had a child, moved back down to Louisiana in, I'd say, 1990, '91. Went to work for a company called ECT here in Baton Rouge, headquartered out of Florida and pretty much managed the environmental division over here. And we specialized in the underground storage tank assessment and remediation work as well as other contamination assessment-type activities.

In 1994, I started ICON Environmental Services. And I'm the president; I'm the owner. I had a co-owner up until about four or five years ago. And so we have, throughout our existence, done projects, such as permitting. We do a lot of work with solid waste landfills, various different open permits and contamination investigation. We did -- we held -- held a patent, still do I guess, in a sampling device that Dow Chemical here in Plaquemine used to complete their deep groundwater assessment, chasing vinyl chloride in the MRVA.

We do and still do geophysical logging. We have a logging unit. We have all of our own sampling equipment, probes, multiple probes. For many years, had mud rotary drilling rig that I no longer use because it's a pain.

And we're involved with -- we're still

involved with landfill work, a lot of contamination investigation, a lot of this type of assessment in oil fields. I looked at oil fields all throughout the state.

We recently completed a permit for a Class 1, Class 2 injection well where the Baton Rouge fault was a critical concern. So it was a permitting complication that we -- we ended up solving by including and modeling the use of an observation well for pressure-monitoring to monitor the wastefront before it hits the Baton Rouge fault plane. So it was a pretty complicated procedure, working with Steve Lee on that.

Q. Have you worked for -- you mentioned Dow Chemical. Has your company worked for the industry?

A. Yes.

Q. Why don't you tell us a little bit about that.

A. Well, we've done contamination assessment, remediation, RECAP evaluations. We did a big MO-2 RECAP evaluation for Pennzoil up in a Shreveport refinery. Recently did some remediation right outside of Lafayette for a pipeline release of hydrocarbons that had sprayed onto an adjacent farm. We're a response action contractor. So we're still doing a lot of underground storage tank assessment and remediation. We've done groundwater remediation since the company started. At any point in time, we have three or four groundwater remediation projects that are in progress. So I think right now, we've got four that are ongoing.

Q. And so over the years, Greg, how many groundwater remediations have you done?

A. I really don't know. I mean, it's --

Q. A lot?

A. Lots, yes, yes.

Q. In Louisiana?

A. Yes. We've -- we've done probably the deepest groundwater remediation that's ever been done, for Dynamic Exploration. They had an injection well that -- that stopped receiving water efficiently and, instead of reworking the well, they got a stronger pump and saltwater breached at the ground surface. So we went in and converted the former injection well into a recovery well and did deep assessment work. We went in and set 4-inch casing down to 3,000 feet, several assessment wells and used bridge plugs and perforating equipment as well as J-baskets with filter sand to pump and recover groundwater. So we went in and assessed, I think it was a 2,000-foot-deep sand, and then we ended up remediating a 1700-foot-deep sand in the seventh Evangeline aquifer and that was right outside of Basile.

That project lasted about ten years. We ended up converting one of the assessment wells into recovery. Constituents of concern there were the -- the drivers was benzene, barium and chlorides. And background was the standard, the remedial standard that we were shooting for and had achieved up until I was no longer associated with the project. That's probably five, six years ago.

Q. Okay. And what is your experience in dealing with the regulatory standards in Louisiana, specifically 29-B under RECAP?

A. I've been working with projects as per Statewide Order 29-B for years now.

We did compliance work for the old Reliable commercial treatment facility in Livonia, and I was part of the team that closed that commercial facility. So we terminated -- it was a groundwater recovery project that we operated and we ended up terminating the groundwater recovery project and closed all of the residual untreated material into four big treatment cells, which I'll, you know, talk about later.

And then we used 29-B on all of our oil field assessment work, which has been ongoing for years.

Q. So you would say over ten years, you've been dealing with the Office of Conservation not only -- for the industry outside litigation and litigation with the Office of Conservation applying 29-B?

A. I'd say well over ten years. Carroll Waskom was still there. I was still doing projects when he was in control.

Q. Don't show your age.

A. Just look at me, man.

Q. Let's talk about RECAP.

A. Okay.

Q. What's your experience with RECAP?

A. RECAP is a part of all of our underground storage tank assessment work. So it drives it. It drives it, and we use RECAP for pretty much every environmental investigation project that is regulated by the DEQ. Even the landfills that we do, the subtitle D landfills, which are non-hazardous, typically their permits are driven by the permit language, and we design and monitor groundwater monitoring networks at the landfills, detection monitoring, and sample those and run statistical analysis on the data to make sure that there's not a statistically significant increase in any parameter. And if there is, it could kick in assessment monitoring. But in doing so, you'd have to develop a site-specific, you know, groundwater remedial standard. So all of that is done under the framework of the RECAP document. So it's just RECAP kind of drives all of the work.

Q.   And have you dealt with and how many years have you dealt with DEQ regarding classifying aquifers in Louisiana, shallow and deep?

A.   I mean, it's -- it's been since RECAP was promulgated, you know, 1998 and before. Before RECAP was promulgated, we were doing groundwater assessment and remedial activities that had Department-approved benchmark standards back at the time. But it was before the RECAP, you know, got developed. In '98, there was a '98 version and a 2000 version where there were a lot of changes that occurred between those two and then more upgrades to the 2003 version, which is the current one that is used.

Q. In all of the years that you talked about and dealt with DEQ regarding classification of aquifers, have they accepted your methodology in determining the classification of aquifers?

A. Yes. I mean, it's been a long history. Every site is different. We've had -- actually --

Let me correct that. Not in every instance. We've actually had sites that the data supported for instance, a GW-1 groundwater classification for an underground storage tank site. And quite honestly, you know, for monetary management of the trust fund, we were directed to use a GW-2 in place of the GW-1 to put less pressure on just the money situation of the trust fund.

So in those cases, we left our recommendations on the record in the reports but just basically said that we were directed as per the DEQ to use a GW-2 instead of a GW-1. And then at another time, we had a site where we classified the aquifer as a GW-3 and the landowner challenged us that it was a GW-2. So that required a work plan and a pumping test to verify groundwater classification. But other than that, it's -- yeah, they're typically approved.

Q. And the methodology, the slug tests --

A. Correct.

Q. -- the sustainability, that's normal everyday things that you do and work with DEQ and they -- that's things that they have accepted to -- might disagree on maybe the classifications, but those are the methodologies that are accepted and used by the DEQ?

A. That's correct.

Q. And Mr. Miller, you have qualified in court, in the courts in Louisiana, as an expert in geology, hydrogeology, environmental site assessment, regulatory compliance of 29-B and RECAP?

A. Yes.

Q. And you've also qualified in those areas in front of the Office of Conservation during most feasible plans?

A. Yes.

MR. CARMOUCHE: At this time, Your Honor, I'd like to offer Mr. Miller as an expert in geology, hydrogeology, environmental site assessment, regulatory compliance and 29-B and RECAP.

JUDGE PERRAULT: Does Chevron have any cross?

MR. GREGOIRE: We have no objection as to this matter in this proceeding.

JUDGE PERRAULT: All right. Mr. Miller shall be admitted as an expert in the areas that were just cited. You may proceed.

MR. CARMOUCHE: Okay.

BY MR. CARMOUCHE:

Q. First, Mr. Miller, before we dive into your PowerPoint, I want the panel to -- I want to show this --

MR. CARMOUCHE: Can you show this slide, please, Mr. Angle's slide?

BY MR. CARMOUCHE:

Q. You've been involved in most of these most feasible plan hearings; correct? Not all of them?

A. I wouldn't say most, but I've been involved in some.

Q. Okay. Let's go down to the bottom. It's my understanding that Hero Lands, LA

Wetlands, Jeanerette Lumber and Neumin Production were all limited admissions.

You're aware of the new changes that occurred and how, if an oil company -- you're aware of the changes?

A. Yes.

Q. Okay. And you were involved in Hero Lands, LA Wetlands and Jeanerette Lumber?

A. That's correct.

Q. So in all of the admissions that have been done after the change, are you -- is it your understanding that in Hero Lands, LA Wetlands, Jeanerette Lumber and Neumin, that the landowners chose not to participate in the hearing and submit a most feasible plan?

A. Yes.

Q. I wasn't part of any of those cases with you?

A. That's correct.

Q. So this is the first time that I've hired you to participate in a most feasible plan of a limited admission?

A. That's correct.

Q. And the landowners in this case have chosen to submit a most feasible plan to the

Office of Conservation?
A. That's correct.
Q. Okay. Let's talk about your assessment methods and kind of take the panel through what you do and have done to assess the property.
A. Okay. We take this approach on pretty much every project. We -- we get a property description, which, believe it or not, sometimes that's the last thing to get finalized on these things because there's oftentimes, you know, issues with the property boundaries. But we'll get to that.
We'll obtain historical aerial photography and then go to SONRIS and try to download and properly locate all of the, you know, the old well locations. We'll also use SONRIS to plot more well data all into an AutoCAD database and kind of, at that point, develop targets. Because our charge is to assess for potential contamination from historical oil and gas operational activities.
Once we develop these targets, which can be represented by pit features, old production facilities, scarring on the surface of some of these old historical imagery, we'll then go out

and perform surface geophysics. In the early days, we used a Geonics EM-31 terrain conductivity meter and replaced that with -- called a Geophex EM instrument, which we call a GEM-2 unit. It's a little different from the EM-31. The EM-31 is -- its depth of investigation is dictated by the electrode spacing. And that's why those old instruments was a box with these two long poles, and that was your electrode space.

This instrument, it has a fixed electrode spacing and, instead, utilizes a variable frequency to vary the depth of investigation. We'll typically run three frequencies. The high frequencies don't penetrate as deep as the deeper frequencies. It's not an easy method to be able to sit here and tell you how deep the instrument is seeing, but typically what we'll do is we'll compare the data from the shallow to the deep investigation at the lower frequencies. And a lot of times we can, from that, determine whether most of the salt signatures are shallow in the subsurface or deeper. But the surface geophysics then give us a good idea as to, you know, the potential masses of produced water impacts in the subsurface that we might be dealing with.

Then we go out into the field and begin our intrusive assessment, and that's done with soil sampling and coring and soil conductivity logging. So we use a geoprobe conductivity log and that -- let's see. I think I've -- let's just go through here. It's historical aerial photographs. Here's one of this site.

Q. What does this information tell you, Mr. Miller?

A. It shows where -- the wells that we plotted according to the permit locations relative to section lines, which can differ a little bit from where SONRIS shows them.

And this shows some of the old features. This is a '71 image. So there's production facilities, production pits, reserve pits, probably a burn pit, a flare pit and then the sinkhole associated with the Calcasieu National Bank No. 1 blowout well.

Q. So there was a blowout. What year was the blowout?

A. 1941.

Q. Okay. And there's some history about the blowout; correct, that you were able to

discover? Descriptions of the blowout, I guess?
A. Yeah, I did a search and found an old case -- legal case history, I guess, is what it is -- of a lawsuit that was filed after the blowout for compensation for a loss of crop damages and I guess property impacts like -- not -- not subsurface property but like rusting metals on barns and fences and whatnot.
Q. Okay. What did you find?
A. That --
Q. Go to the next slide.
A. Yeah. Here.
This is the best summary out of that whole document that I was able to -- the best description of what was going on. The well -- just a little preface here -- they had three strings of casing and when they ran the smallest string of casing down -- I think it was to the Camerina zone that they were intent on producing, they perforated the base of the casing right above the shoe to try to pump and squeeze cement into it -- you know, in the preparation of making a well. When they perforated it, they were unable to control the pressure, and they fought that for a few days before it actually blew out.

So it blew from July 20th through August 13th and eventually killed itself with sand. But during the eruption, as you can see, it was erupting large volumes of saltwater and sand, mixed with distillate and other substances. Shooting several feet into the air. About half of that time frame, the well caught on fire. And as they say, the atmosphere appeared foggy by spray from the well and was carried by wind and air currents over an area of about 6 miles from the well, where it settled like dew on farms, buildings, and equipment in that section. After drying, it left a precipitate of brownish-gray sediment that killed rice and cotton crops as well as other vegetation and trees and corroded and rusted metal equipment, roofing, fencing, guttering, screen wire, et cetera.

The heat dried the crops in the area, and the plaintiffs that were filing this lawsuit had some crop damage. And they're describing a great deal of salt and other mineral substances covered the fields, buildings and equipment in varying quantities, according to the wind direction and its velocity. And it seriously damaged the rice crop and watermelons and substantially damaged pasturelands, metal equipment, barbed-wire fencing, roofing, guttering, screen wire, et cetera. So it's a pretty significant blowout that occurred out here.

Q. Are you aware, did they ever plug the well?

A. There's no records that it was ever plugged. You know, they're saying the sand -- the sand bridged it. And then the Calcasieu National Bank No. 2 well file, there's descriptions that -- that that well was actually being drilled as a relief well, and then this well bridged over with sand. And so they just went ahead and completed the No. 2 as an oil well.

Q. Okay. And we'll get to your opinions about that.

A. But there's no record of No. 1 being plugged, and there's still a flooded crater. So there's really no physical way to get on it, to have anyone have gotten on it to kill it and set, you know, plugs and -- to plug the well.

Q. Okay. And then, so let's -- you talked earlier about surface geophysics and the instruments you used. Why don't you take us through that.

A. There's a photo of the GEM-2. It's smaller than an EM-31 and lighter, which my employees really appreciated that change over to EM-31. And it really -- the benefits of it is you can run multiple frequencies concurrently. So we can go out and gather multiple frequencies all in the same pass of a transect. So it's much more efficient and then -- and it's logging -- it actually logs -- I think it's ten or 15 data points. And data loggers averages those points into a single value that is logged with the geographic location from the GPS on either a 1 or a 2-second frequency. So it does that to kind of provide a sense of a very small-scale average without resulting in such a huge data set that's difficult to manage. So it's a really good equipment.

Q. And you did it on this property and can show the results?

A. Yeah, this next figure on figure 15 shows where the operator walked with the instrument. Those are our transects. And we find, you know, there's a -- if you can see, it somewhat simulates a cross-hatch type walking pattern. Usually, you know, provides the best data for contouring, which the next figure shows how we then import that data into Surfer, and we use a Kriging method to evaluate all of the individual data points and provide a contour map.

Generally, we have, all through these years, kept the scale, which is milli-siemens per meter, consistent in all of our reports because we've done so much of this, people get accustomed to the color scale.

So when we start getting into the greens and yellows, reds and magentas, you know, at that point, you're usually looking at indications of either salt -- subsurface saltwater impacts from historical discharges. But the instrument, it's an electromagnetic instrument, so it will always pick up any conductive material, such as buried pipe. So if you look at Area 5, you'll see like a long linear feature that's extending southeast from the limited admission area, that's likely some buried metal that it's responding to.

Q.   You've got to point to this screen, Greg.

A.   No, here it is. This feature right here is probably some buried metal, whereas the feature within the AOI is a typical signature of produced water impact.

Q. And this is -- this is something you do preliminarily to tell you what you generally can find out there and then you want to go out and do more work to verify this information; is that fair?

A. In these types of cases, yes. We've also used this to map like -- we recently mapped an unauthorized landfill to map the extent of waste. So it can be used for those matters as well.

Q. Okay. Okay.

A. As well as we've located buried drums with it and looked for buried wellheads because there's a magnetic susceptibility setting that can be run in the instrument to try to intentionally find metal.

Q. Then you talked earlier about soil conductivity logs. Can you take us through that and the appropriate purpose?

A. Yeah. This is an instrument that -- we used two things. The conductivity log is a workhorse. It's a solid piece of pipe with a Wenner array electrode system on the end of the pipe. So it's one -- it's little button-looking things that sends an electrical signal and three receiving buttons. And it is simply sending out an electrical signal as you advance this probe and it is monitoring the resistance of electrical flow from the sending node to the receiving nodes.

And it logs as you drive it, and it's -- you actually use a wire. I've got a picture of that. And you measure the soil conductivity with depth, and it gives you a continuous profile that shows up in the field on a computer.

And the second tool that we use is an HPT tool, which is a hydraulic profiling tool, which was developed by a co-worker of mine Seth Pitkin up in the Northeast and John Cherry at Waterloo, and they sold the system to Geoprobe. And that's a system where it's a little bit more finicky, but what you're doing with that probe is you've actually got a pump and a water reservoir at ground surface, and you're continuously pumping water into these ports on the probe as you're attaching the probe. And it's monitoring the flow rate as well as the back pressure, the resistance to flowing. And from those two things, you can get a sense of what the lithology is that you're in or the permeability, the relative permeability.

So it's a good tool for, for instance, showing if the clays that you're in are a good, impermeable fat clay or whether the clays are more brittle and leaky and quite permeable.

Q. Okay.

A. Next photo, that's a picture of the conductivity probe. As you can see, there's just a physical wire that hooks up to a computer. So you've got to prestring it. You pretty much predetermine the depth of investigation by the amount of pipe that is strung up. And it's a matter of having the Geoprobe hammer the pipe as you advance it into the subsurface and record the response.

This next slide is H-12, and this is a good typical log, conductivity log, and we try to keep a consistent scale from zero to 2,000 millisiemen per meter. That's just based on years and years of experience of assessing oil fields generally in uncontaminated areas. And this tool was developed really for lithological characterization. And typically when you're in an uncontaminated environment -- and that means like no salt contamination or any other conductive contamination -- the instrument will typically register anywhere from about 150 to 350, like in this area, to be indicative of a clay. And below that, it is clay-deficient. So that could be anything from silt, sand, peat will show up as a low reading on the conductivity log.

By the time you get above 450, 400, over 500, that's usually indicative of a conductive contaminated soil. So in this instance, we have a little bit of contamination, for instance, from about 2 1/2 down to 16 feet, 17 feet. It's low-level contamination and then it slowly increases and really spikes high up around between 50 and 65. It's going off scale here, but we do have values beyond that. So we could shrink the scale and plot all of the data, but that is a screaming hot response for a conductivity log.

Q. "Screaming hot," meaning?

A. I mean it's indicative of high levels of contamination.

Q. High levels of contamination?

And you've been using this instrument and this is the type of instrument and information that you have relied upon and submitted to the Office of Conservation before?

A. Yes. And what's good about it, it's --

it's a continuous log and it's not subjective; in other words, it's a measurement.

It's -- like I said, this is a workhorse piece of equipment. You know, we test the probe heads before use, and there's a block that we use to test the isolation as well as the response of each of the nodes.

Really good tool. HPT, we've been using -- let's see. This, we've gotten within the last few years, two, three, maybe four years. And it is an excellent tool as well. But it's a bit finicky because of those ports that we're pumping water through, occasionally when we're in -- the profile is predominantly clay-rich. Sometimes those clay ports will plug on us and not respond like they should. And then when we're working, you know, basically can't work in freezing conditions because the water freezes. But other than that --

Q. What does this show you, Greg?

A. This is a plot of an HPT log at H-19. The HPT also runs conductivity concurrently with the monitoring of the pressure as well as the flow. So generally when you're just -- kind of a nonquantitative method to look at these logs is, is when your flow drops to a low point and your pressure's high, that is usually indicative of a good fat clay that is relatively impermeable. When you start getting lower pressures like this, that means that -- as you can see, the core descriptions here show damp silt lenses throughout this clay section here, and that's reflected in the EC data, as well as a decrease in pressure and a slight increase in flow. So it's just responding to the fact that there's permeability within the silt lenses that have a little bit of elevated conductivity in this. So you can really infer a lot of data from a continuous plot of this data in conjunction with the core samples.

Q. And then you have H-21?

A. This will be the third type of log you'll see in our report. And this log doesn't run either the conductivity probe or the HPT because we were at a location that was -- had access issues. So this was a Geoprobe mounted on a Marsh Master, which has more of a limited depth capacity. So in that instance, we just use a field pen to log the EC, the soil EC. Similar to what Dave Angle was describing yesterday. That's the protocol that they use as well, to provide,

again, a plot of field EC versus depth.
Q. And is it fair to say that all the instruments that you went through is -- not only determined the contamination but also determines the lithology of the site?
A. Correct. All --
Q. And why is that important?
A. Well, lithology is -- it's in -- it has everything to do with fate and transport, and then the tools provide a vertical profile of produced water impacts in the subsurface.
Q. Okay.
A. So between -- we've done this a number of times too. Between the surface geophysics, the GEM data and the conductivity probe data, it provides a three-dimensional picture of a potential mass of salt that might exist. And there's some sites we go to, it's pretty much all we're hired to do is go out and do a GEM survey and some conductivity probes to get a feel for where the potential contamination is.
Q. And to verify these instruments, do you actually go out and take samples?
A. Correct. Like I said, we've got Geoprobes, there's -- here's an AMS. We've also

got Geoprobes. This probe is still in operation. These probes are capable of driving standard Geoprobe tooling as well as a hollow-stem auger head on it, so we can set wells with it. So we use these to set, for instance, monitoring wells at a lot of our underground storage tank sites.

Here's an example of a core sample in an acetate liner. Generally you cut those in half. This is the block with razorblades in it that you use to slide it along the acetate liner and slice it longitudinally and expose a core sample of that. Field measurements can then be taken on the outside of the core sample. And typically, you skin the smear layer off of it and then that is a source for soil samples for the laboratory.

Q. And that's also to verify that your instruments were operating correctly? Do you also do a visual lithology?

A. Yeah, we define lithology as well as collect core samples for analysis.

Q. Okay. Next? You set wells?

A. Yeah. That's standard small-diameter wells with a Geoprobe. We typically use a three-quarter-inch factory-slotted and put a filter pack with a bentonite seal above that and then route it to ground surface with a surface completion.

Q. All methods accepted by Office of Conservation and DEQ?

A. Yes.

Q. Let's go to geology and the groundwater conditions at this site.

A. Okay. This map shows site-wide boring locations where we set monitoring wells. As was mentioned yesterday, we had targeted a series of wells on the east side of the property to try to get some distance away from the historical operational activities, recognizing the -- we knew from the get-go that it was going to be hard to find a location from background at this site because of the description of the blowout in that first well that was drilled out here because it had such a large fallout area. So it's -- it's always difficult to try to predict where you could locate a monitoring well that's going to be representative of background conditions that hadn't been influenced by site activities or by any other potential anthropogenic source. But that's where we chose and... let's see.

Q. Next?

A. Yeah, next slide.
Pointer's not operating. There we go. This is a close-up of the boring location. So the blue labels are where monitoring wells were installed, and then the black labels are where soil borings of various different depths were occurring.
Q. Mr. Miller, let me stop you there. And we'll get into it a little later, a little deeper, but the extensive -- this is extensive sampling in these areas?
A. Yes.
Q. And these areas that you sampled are where Chevron admitted that there was contamination; correct?
A. That's correct.
Q. Okay. All right. Let's go to -- you created some cross-sections?
A. Yes. Next slide. This pointer's no longer working.
Pointer works but the advance doesn't.
This is Profile A, A prime. And at the get-go, we were -- for this aspect of this case, with the limited admission, we were charged with developing a most feasible plan to address the

remediation Chevron admitted in this case. So in looking at all of the data, we evaluated it with the thought in mind to create the most feasible plan to address both the soil as well as the groundwater remediation.

So this is a profile, as I said, from A, A prime to kind of -- runs right through where the sinkhole location is and through Areas 2 and 4.

THE WITNESS: Let's see, Scott. Can you zoom in, say, about right in here?

A. On these cross-sections, we've got these little brown numbers which represent laboratory results of EC measured in the core samples.

And for instance, at H-10, we've got, in red, the conductivity log response and in blue, the HPT pressure. So the core data is standard hatch patterns where clay and silty clays are hatched diagonally dark, and silts have the unified code of vertical blue bars, and then, if there's sand, it will be hatched as well.

So what you can see in this HPT log is this clay here at H-10, according to the HPT log, has quite a few zones of relatively high permeability. We were able to pump water at relatively low flow. So it's indicative of a leaky clay. As I think John showed yesterday, there's a shell hash layer we were able to correlate through a number of borings. These shell hash layers can be pretty important in a contaminant fate and transport evaluation because they're permeable and they typically are only inches thick, but sometimes they are associated with little silt lenses and it's an area where contaminants can spread laterally in the subsurface. And they also conduct water in the case of excavating. That would be something you'd want to know, that you dig into the shell hash and it will dewater it and it will flow into an excavation.

I've got what's called a possible disturbed zone around the blowout. This is really not based on any kind of core data or log response or anything of the sort. This is drawn based on my experience with evaluating blowouts, and I've done a number of them that, when you have a blowout of this magnitude and violence, there's typically a disturbed zone around the casing of the original well that blows out. And it's, a lot of times, comprised of a mix of sand and cement and just kind of what was originally probably a slushy material while the well was blowing out that then settled in time.

And sometimes that disturbed zone can be transmissive; sometimes it's not. Kind of site-specific. Also on this cross-section, I've got where -- in red, these boxes, is where the soil EC, the extent, the vertical extent, in this case, exceeds the 29-B standard. And then I've got in a blue box where soil samples exceeded the 29-B leachate chloride test. And I'll get into how we evaluated that in a bit.

Also, on this cross-section is water well profiles. In this instance, Well 6649 Z, I think, is an old rig supply. And so we put the data from the driller's logs onto the log to get a sense of where they're calling the top of the Chicot Aquifer.

Q. And in looking at this crater area -- and I'm not asking you as an engineer but as a geologist and a hydrogeologist. In looking at the contamination, they talked about top-down, bottom-up. Take us through what your concerns are and what do you feel about that.

A. I think what we're seeing at H-12 is that a high spike that we're seeing at like the chlorides of 39,000 and ECs that spike up above 50, is probably a result of bottom-up, in my opinion, particularly in light of the description of the blowout as was described in that case history.

This went for a while. So we know that the Camerina zone, the 12,000 feet, flowed up along the -- it blew out. They lost control of it and it blew on the outside of the surface pipe. So at some point, it exited the casing and began flowing on the outside of the pipe, which went through the Chicot, through the confining unit, and up onto the ground surface. So that migration path had to have occurred. So that's No. 1, the main thing, in my mind.

And I think that, as the well was blowing out, as was described, fluids and sand deposited throughout the vicinity of what turned into a crater. And that's evident on some of the historical aerial imagery. And that material was then available to leach into the subsurface profile. And I think that slight elevation in the H-12 conductivity probe is reflective of that type of top-down migration pathway. So there's really both going on, but without a doubt in my mind, what we're seeing down at 50 to 60 feet is -- it's one of two things. It's either a residual from the bottom up or there may be a continuous slight leak that's occurring, but I have no direct evidence that that's still going on.

MR. GREGOIRE: John, hold on.

Judge, so Mr. Miller has been tendered and accepted in certain areas as an expert witness. None of them include expertise in well design, completion operations. He's not a petroleum engineer. So I think it's important for you to caution the panel or to instruct the panel that he's giving his opinion testimony. This is not expert testimony. It falls outside of the areas for which he's been tendered and accepted as an expert.

MR. CARMOUCHE: First of all, I started the question by saying "you're not an engineer but as a hydrogeologist and a geologist." This is stuff he does on a regular basis for blowouts to determine if the contamination and what -- how's the water flowing. I mean, that's what he does for a living. I'm not asking him about why the well failed or...

I'm not asking him that.

JUDGE PERRAULT: All right. I think y'all understand the limits of his expertise in this area. He's not a petroleum -- a petroleum engineer.

MR. GREGOIRE: Petroleum engineer.

JUDGE PERRAULT: He's a geologist and a hydrogeologist. So take his opinion based on his geology and hydrogeology background. All right.

BY MR. CARMOUCHE:

Q. And Mr. Miller, looking at the contamination and to determine if the groundwater flow -- still communication, not anything about the engineering of the well. But what would you suggest that this panel require to determine if it's still coming up?

A. A couple of things here. One, we're seeing pretty high residual salt impacts remaining at that 50- to 65-foot interval. And as I said, there's no good way to put a date as to when that got there, but the fact that we're getting benzene at -- in that H-12 monitoring well 80 years later demonstrates that in 80 years the benzene has not biodegraded to nondetect. So that's a little unusual, given that long time frame. That kind of makes me think that there might be a potential leak.

What I typically look for when I come to that conclusion is I go to the potentiometric maps to see if I can see a hydraulic mound that might exist around the crater, positive mound. But I really still don't know what the hydraulic pressure that could be contributing flow to the surface at any point in the profile of the original blowout well; I don't know what that is. So I really don't have the data to do that sort of a pressure analysis.

So what we did is, in our feasible plan, is we proposed to install three deep monitoring wells that penetrate the Chicot Aquifer triangulated around the sinkhole just to see -- we don't know what potential impacts might be at the top of the Chicot Aquifer. So that's part of what we're including in the plan for additional assessment.

Q. And so there was doubt as to bottom-up, whatever. But you found that -- we have a 1953 aerial that was after the blowout that would show the condition.

MR. CARMOUCHE: '53. Can you zoom in?
A. Yeah, so this is 12 years after the blowout and there's still, you know, extensive salt-scarring around the crater. There's no record anywhere of any continued gassing like I've seen in some other sites that I've worked on. There's just no record of it. Sometimes you'll see -- for instance, I'm working one in Westlake Verret where the gassing was documented to occur field-wide for like a ten- or 15-year period.
And that was -- and that particular blowout, the vent was a quarter of a mile from the well location. So that's an example of how some of these blowouts can, at some point, deviate from vertically upward and go at an angle to surface of the ground surface. But in this instance, there's just a single crater but no -- nothing in the historical record that describes continued gas.
BY MR. CARMOUCHE:
Q. Let's go to your B cross-section, unless you have anything else on that one?
A. I don't think so. B is on -- across Area 5, and I think that's maybe Area 6 or 8. I forget what it's labeled.
But if we can just zoom in here. What I

recognized in evaluating all of the core data is -- and on all of these sites, I attempt to do a proper geologic model of how these sediments were deposited because that's critical to a fate and transport analysis on every site that I work on.

For landfills, it's critical because we're actually mapping the old historical depositional environment. So it matters here.

We -- what I've -- was obvious to me is the aquifer, which is a single hydrologic unit, it's a single aquifer, but it is comprised predominantly of two permeable beds, which I denoted bed A and bed B. This is bed A, coming in at about 35 to 40 feet, and then bed B, overall, had a little bit more larger grain size, a little bit of greater thickness in some areas, and both of those beds -- if you could zoom out --

Both of those beds, as you go towards the east, increased in thickness. And what's not shown on here are H-23, H-24, and maybe H-21. Those three that are on the easternmost side of the site had like almost a 30- or 40-foot thickness of sand and silt.

So this is all in the Beaumont Holo formation, the Prairie Age. From having worked throughout this area of Louisiana, historically, when sea levels were lower, the Beaumont had been incised into some channels due to just surficial drainage at the time. And then when the sea levels rose, these channels filled with fluvial deposits. So what I did is then took all of the data and mapped it into isopach maps. So I focused on looking strictly at the data within the A bed and the B bed, recognizing that there's permeability between the two, but those would give me a sense of an environment of deposition.

So the next.

Q. So this type of channel, or an aquifer, I think as you described, you have seen before, this is not something unusual?

A. No. It's -- it's less prevalent right here. It becomes really prevalent further to the west, extremely prevalent around Lafayette, Bosco, in those areas where the confining unit of the Chicot is absolutely dissected with these filled channel sands just to the point where drillers, you know -- and a driller installing a water well is logging their data from -- it's mud rotary. I guess you guys have logged behind a mud rotary rig. It can be difficult. Unless you have what's called a mud puppet, it vibrates the cuttings to allow the driller to better log what he's looking at.

So generally they log it based on the bulk of the returns coming into the mud pan. So it's still hard for me to do it at my age if you don't have that type of equipment.

Q. C cross-section.

A. Yeah. Again, this one is a north-south that, again, shows -- it shows the A bed and then the B bed and the shell hash layer and then, again, there's another shallower silt that turns up right in this area (indicating).

Again, HPT is showing permeability within the clay. The pressure here, you'll see at H-15, there's a diagonal slope overall, which is reflective of the increasing pressure due to the -- you know, the higher and higher column of water. It's the hydraulic pressure with depth. So as you go deeper, the hydraulic pressure increases. So that's a typical profile on a pressure curve.

Q. So you took all of this information, Mr. Miller, and you were able, with all of the data you have and competence, to correlate the single varying aquifer under this site?

A. Yes. And I'm recognizing that these two permeable beds are affecting contaminant migration. If you look at H-18, you'll see how there's a really high spike of, you know, response from 10 to 20 feet. Still elevated here and then it starts dropping down, and then right at the base of the B zone, the B bed of the aquifer, you get a little spike here and you get a spike here. That's something I typically see a lot, and that's a remnant of salt-migration through this lens and as -- and that was a historical thing that then seeped into the underlying confining unit. That's a profile we see a lot that's indicative of lateral migration of salts. Because, you know, it really kind of depends on the source of the salt; but with produced water pits, it can be pretty dense and you end up with a density flow as it migrates into the subsurface. So the saltwater will migrate vertically downward, get into a permeable zone, spread out a bit and then seep down. So that's a typical profile of -- reflecting that former migration pathway.

Q. Okay. All right. You also did some isopach mapping?

A. Yes.
Q. What's the relevance of that?
A. Again, it's to determine the lateral continuity of the most permeable portion of the shallow aquifer as well as to get a handle on environment of deposition. And as you'll see, here's what I mentioned, those three wells off to the east. H-32 had a 29-foot thickness of permeable material and that was of just silt with the sand on the bottom. So obviously, this was an axis of deposition historically at that -- you know, it could be like a distributary or fluvial sand that was deposited in a channel that was probably incised through an old back-swamp deposit. And so isopach shows lines of equal thickness interpolated between the data.
THE WITNESS: If we zoom into this area to this area, Scott; right in there (indicating).
A. It's hard to see on this, but on a paper copy, the data that was used is in these little boxes. And it's going to be a range in depth. And then below the line is the cumulative thickness of the silt, clay silts, sands, silty sands that exist within that range. And that

provided the data that the contour map was made. So if we zoom out a bit.

THE WITNESS: Go back -- yeah, like that.

A. And again, that's described in the legend here. And in the boxes, what I've included is the theoretical yield from the slug test data that -- for all of the wells that were slug-tested and the box of the data and the well labels above the box. So you can see this is the A bed of the shallow aquifer. You can see a yield of over a thousand gallons per day in the east. We didn't test this real thick section, just because it was so far from the limited admission section and so far from historical activities. It would have -- likely have yielded way higher than anything else we've tested.

MW-3 was 1400 and then we have low -- wells with really low yield, like MW-5 was 27, MW-11 is 47.

So that kind of gives, in one picture, a view of the relative thickness of the strata, the water-bearing strata, as well as its estimated hydraulic conductivity based on the slug test data, which again, I'll throw this out at this point: In my opinion, the slug test data always under-predicts hydraulic conductivity as compared to a pumping test. I've got publications I'll be glad to share that show generally slug test data is about four times lower as compared to a pump test data in the same well.

So that -- those types of studies kind of eliminate the bias that might be caused by the installation method. But the installation method, again, can also reduce hydraulic conductivity because it's a direct push that compresses the soil around the borehole. And sometimes you get smearing, which is very common, which you try to remove in the development of the well, but it's hard to develop a small-diameter well. You can try to surge it.

Typically, a surge block is what is used to break that skin up, which is more common in a 2-inch to a 4-inch well.

For our recovery wells that we put in for remediation sites, we'll always see a noticeable change in yield after surging. So the surge block is effective at breaking up that skin. But none of these wells have had that kind of work done on them. So I always look at the slug test data as getting you within a ballpark range, but I think it's always underestimated. I personally have done pumping tests adjacent to or in the same well that was slug-tested throughout my career, and I've always gotten higher hydraulic conductivities in a pump test compared to what the slug test data will show you.

PANELIST OLIVIER: If I may, this is Stephen Olivier. Based on hearing you talk about slug tests underestimating and the pump test being four times higher, in this case, for this site, would that make you maybe -- would you recommend a pump test to verify groundwater yield in these wells?

THE WITNESS: It could be used to verify it, but as I'll show you on the next slide, our slug test data is so high in the B bed throughout this limited admission area, there's no doubt in my mind that what we're dealing with here exceeds 800 gallons a day.

A pump test, sure, we could go out and do one. You'd probably get way higher than any of these wells are -- these slug tests are predicting.

PANELIST OLIVIER: But the pump test would -- in your opinion, it would verify any information that you have?

THE WITNESS: Pumping test data is always better than slug test data because a slug test is an instantaneous change and it only extends probably inches away from the screen because there's not enough hydraulic stress to propagate further than that. Whereas in a pumping test, you've got an observation well, and I usually put them about 8 to 10 feet away. So you're actually testing the hydraulic conductivity between the pumping well and the observation well. And that's how all of the methods for -- for pumping test analysis rely on the data from the observation well and the distance away. So you're getting a measurement of a much larger slice of the aquifer with a pumping test and a longer duration, which is good too.

PANELIST DELMAR: This is Chris Delmar. For the slug test, are you doing a slug in or a slug out?

THE WITNESS: These are all confined, but all of ours are falling head tests.

PANELIST DELMAR: So slug out?

THE WITNESS: Actually, let's see, it's --

yeah, they're falling head tests.
PANELIST DELMAR: So you're removing water to test it?
THE WITNESS: Or adding a slug of water in some of these.
PANELIST DELMAR: Adding a slug. There you go.
THE WITNESS: Whereas, I think ERM used -- it's a shoe probe tool that actually pumps a slug of air pressure to displace the water or a suction to do the opposite.
PANELIST DELMAR: Okay. So sort of simulates the addition or removal of water in that case?
THE WITNESS: Correct. But in high-permeability formations, it can create oscillation effects, but there's methods to deal with the oscillation as well. It's a different analytical procedure.
PANELIST DELMAR: Thank you.
BY MR. CARMOUCHE:
Q. Mr. Miller, following up on those questions, and we'll go through your opinion about the slug tests, which has been an acceptable methodology as to both Office of Conservation and

DEQ. As I gather your opinion, there's -- we could do a pump test but there's -- your opinion is there's no need to because we've got so much water by the results of the slug tests and all of the other data that we have, it's already -- a pump test would be if you're close to an 800-gallon per day, a pump test might indicate it's higher, but you're confident that the slug test data definitely makes this a Class 2 aquifer?

A. Yes. And on the next slide, I'll show you why. But if one were -- if we were just -- if this was all of the aquifer that we had, this isopach of the A bed with the data that you see here, the fact that we've got a range of 2,000 gallons per day down to some of these that are like 27, 47, this would be a good candidate to recommend a pumping test to confirm aquifer classification if this were the only bed that was out here. Because I look at the data and I see: Man, we're close to that threshold of 800 GPD; that pump test would be a prudent thing to do to confirm it. But if we look at the next bed, the B bed -- can we...

Q. Go ahead.

THE WITNESS: Yeah. And kind of get us

zoomed in right here (indicating). Yes.

A. Look at the results we've got. 5,700, 3,124, 1972, 3127, 1720, 1118, and then a 674.

None of these are -- except for MW-1, is even close to the 800 GPD threshold. And knowing slug tests are going to under-predict a bit, looking at this bed in isolation, it's a slam-dunk that it's a GW-2. It could even be more, but in my experience, there's no doubt this is a GW-2.

And then, in order to be fair, we -- I pooled this 33 GPD from H-27 into the Cooper-Jacob approximation equation that is included within RECAP to come up with a yield, I think, that is in excess of a thousand gallons a day just for the B bed. So without a doubt, in my opinion, the B bed meets the GW-2. So on top of the yield of the B bed, you add the yield of the A bed and it will be additive. So it's -- because it's a single aquifer. These are two beds within a single hydraulic aquifer, and I heard Mr. Angle agree with that yesterday. So that's the water-bearing zone we're dealing with.

BY MR. CARMOUCHE:

Q. Let me throw this out, Mr. Miller. You've been involved in these plans and you've plotted data, hundreds of thousands of dollars have been spent, and then sometimes the plaintiff will come back and say a pump test or not enough information.

And how long would it take to do a pump test?

A. By the time you get a work plan approved, depending on where you're going to do it, you've got to install a pumping well, a 4-inch-diameter pumping well and a number of observation wells, several months. I mean, we've got one that we're proposing at the New 90 site to confirm classification, and we got opposed to it by Chevron. And it's still -- that's been pending for many, many months.

Q. If this panel rushed your plan through, how long would it take you to go out to the site, you got a plan, how long does it take to do a pump test?

A. All of the time is in the work plan approval. And if we've got to get, you know, a coastal use permit, then --

Q. Do we need --

A. -- which I don't think we could get out of that area and pump-test this. We're talking

probably within a couple of months, I would say.
Q. Okay.
A. And typically, pumping tests, you know, are test-specific as to when you can terminate it. Generally you can see, when you reach a steady-state condition in an observation well, the draw-down stops. And you can continue it for a while and then maybe ascertain like boundary conditions. Or if the cone of depression might be growing to a point where it encounters the edge of the channel. And it's a negative flow boundary, so the cone of depression actually gets steeper on one side and then -- so you'll see, in the observation well, you've got a constant head for three or four hours, you hit a negative boundary and then it will start dropping again. There's actually methods to calculate the distance of the negative boundary from the observation well. So there's -- I've been involved in pumping tests my whole career, so there's pretty cool equations that you can do.
Q. Mr. Miller, I've heard several times from this panel about maybe a pump test. And we received plans and we can't come back. Okay?
So are you willing, before this panel

rules, to go out and do a pump test to prove to them that not only the slug test, we'll do a pump test to prove that it is a Class 2 aquifer?

MR. GREGOIRE: Object to the question, Your Honor. There's a specific procedure set forth in Act 312. This panel needs to first arrive at a most feasible plan before any work occurs on this property, by statute. And so that is -- that is defined in the regulations 30:29. So after the testimony closes at this hearing, there is a certain period of time by which this panel has to deliberate, arrive at a most feasible plan; and even before that, it has to provide its proposed plan to other agencies for review and comment.

MR. CARMOUCHE: I disagree. So before they rule -- I don't know if Mr. Rice is here, but he can issue a compliance order.

This panel should not -- if they feel and if it seems this way that this is not enough, we're going to put them in -- he wants to put them in a situation where they don't have the information and then we can't come back. If they disagree and they want to

pump test, they should have done it.
There's nothing in the statute that says we should withhold data from a panel. I mean, that, to me, that shows that they're afraid. Let's go do it. We're that confident. And they're not? Why would we hold this from this panel? Then we're forcing them -- they ought to rule it's a Groundwater 2 just because of that.
MR. GREGOIRE: Your Honor, it's not a matter of whether Chevron or any party prefers to do anything at this property. There is a procedure that the Louisiana legislature has established.
JUDGE PERRAULT: Which section of 30:29 are you talking about?
MR. CARMOUCHE: Your Honor, I would ask I move on and we file briefs after this hearing to you so you can make a decision. Is that fair?
JUDGE PERRAULT: I think that's a great idea. I just want to get the section.
MR. GREGOIRE: Mr. Carmouche can keep going. I'll pull it up.
BY MR. CARMOUCHE:

Q. Mr. Miller, are you finished with this?
A. No.
Q. Go ahead.
A. Also on this diagram is this hatched area that I've got is where all of the borings within this area were terminated before penetrating the B bed if, indeed, the B bed even exists in this area. But we've got, as part of our plan, provisions to do deeper investigation to determine if, you know, the B bed exists here and to characterize it. It's just a function of the borings in this area to not penetrate deep enough to penetrate the horizon where that B bed exists.
Q. Okay. Next slide. What does this show, Mr. Miller?
A. This is a potentiometric map using depth of water measurements that are corrected for salinity effects. And we do that because the -- a well with denser fluid will exhibit a lower physically measured height of the water column as compared to a less dense fluid. And so you -- the proper way to evaluate groundwater flow is to make those density corrections. So that's what this map reflects. So we're seeing an overall flow, undulated flow to the north with this anomalous

low head at the area of H-10. And this was done on May 21.

The next map includes a bit more well -- a few more wells in the data set. This is December of 2021. And overall, we're still seeing a flow to the north, but site-wide, there appears to be a bit of somewhat of a mounded shape on the east side of the property, which somewhat mimics topography. Because in our plan, we've got a LiDAR map that shows contours based on LiDAR data. And the highest elevations at the site are right in the vicinity of these two lower limited admission areas and then around the sinkhole. And then surface drainage, the lower elevations go up to the northeast and to the east. So that's where surface drainage ends up. And so the potentiometric flow somewhat mimics surface topography, which is a typical thing you see when surface infiltration is contributing some recharge to a shallow groundwater system.

Q. And Mr. Miller, on that point, I might go to something Mr. Delmar asked in the beginning. The H-10, I think we talked about, is almost 7 or 8 feet lower than MW-6. Why is that?

A. Let's zoom in here (indicating).

I can comment on it, but I can't answer it. I know, in the paired wells, the data indicates a vertically downward gradient at the site. The data shows that.

You can only see this whirlpool-type effect within a potentiometric surface. And again, this kind of pot map is a 2-D representation of a 3-D flow phenomenon. So you're looking at a slice. But in the vicinity of H-10, there's going to be a strong downward gradient. The gradient is indicative of conservation of mass and energy. So the water is going down, downward at that location through some geologic media. What that is, I'm not sure. I've looked at the boring log of H-10 and if you look at the conductivity log response, it's possible we've got another permeable bed that exists around between 60 and 70 feet. You might want to take a look at that. And if that lower bed -- it would have to be of lower hydraulic head for the shallow aquifer to be draining downward. Our potentiometric surface here is generally within 5 feet below ground surface. The Chicot's down around 45 to 50. So we know the Chicot has a much lower head. We know parent wells are going down.

So something in this vicinity is transmitting water vertically downward, some geologic feature. I don't know what it is. It could be maybe connected to the sinkhole at depth. We don't know.

But it's a phenomenon that I can't -- that's the only explanation for it. On the other hand, we've got, on this event, a little bit of a hydraulic mound here, but that was not seen in the previous event. Those are typically observed through localized infiltration, for instance, in a flooded ditch or a flooded area, is something you typically see.

Q. Okay. And so maybe some more evaluation to determine what that phenomenon is and is it migrating deeper and more sampling needs to be done in the deeper zones?

A. I think it would be really prudent to take additional potentiometric readings in the existing monitoring well network and kind of get a temporal aspect as to what's going on. But there's something squirrely going on in that area which could have a potential effect on fate and transport.

Q. Okay. Before we leave groundwater, you

mentioned something earlier and I think it's important.
You worked on LA Wetlands; correct? And that's on Mr. Angle's chart.
A. Yes. I think that's -- I think that might be what we called the Entergen site.
Q. Right. Is that the site that you testified in the most feasible plan?
A. No. No.
Q. What's the site you testified in the most -- you testified or worked and they said go do -- you had the slug test data and they said go do a pump test?
A. That was -- I testified in a hearing to adopt the feasible plan in that case.
Q. In what case?
A. In that Entergen case.
Q. Okay.
A. And there was another dispute about groundwater classification, which -- another kind of real similar situation where the slug test data, there's no doubt in my mind it was supporting a GW-2 classification. So I proposed a pumping test and we got opposed by Chevron, so we had to go in front of the judge to get approval to

do it. So we went through the process and the judge says, "Yeah, you can do it on your own nickel, but you've got to get an approved plan." So the plan is apparently pending in the Department of Natural Resources.

Q. Thank you.

Okay. Let's turn to soil source leaching evaluation.

A. So we run the 29-B leachate chloride standard, unlike Chevron's consultants who don't do this. They go straight to an SPLP chloride test.

We use the leachate chloride because, first and foremost, number one, in my scientific opinion, it's incredibly accurate. Number two, it's required as a 29-B constituent to run them in accordance with the laboratory procedures manual.

Q. And that's what I showed Mr. Angle yesterday?

A. That's correct.

Q. That's -- to submit a plan, you -- it says you have to comply with Chapter 6, which is the laboratory procedures, which is what you talked about?

A. Correct.

Q. Not only does the rules require it, you're going to go through why it's -- DNR, Office of Conservation's, that's in their regulation, SPLP is in DEQ, and you're going to go through why the Office of Conservation's regulation is the most accurate?

A. Yes.

Q. Okay. Go ahead.

A. So I mentioned previously that I was part of the team that closed this Reliable treatment facility. There was an awful lot of untreated waste at this site, so we ended up with three or four 20-foot-tall mounds of reused material that got blended with -- that was brought into the site and mounded up. But we had been monitoring this commercial facility for many, many years before the closure. So the plot on the bottom shows the chloride concentrations in Well 18, which happen to be adjacent to, I think, Unit 6 cell, which was constructed right next to the well.

And so we had -- we were looking at -- at chloride concentrations of about 25 milligrams per liter for many years and then the construction of a pile occurred between '97 and '98.

Characteristics of that pile, the soil, the blended soil, had a maximum EC of a 7.5 and a leachate chloride standard, or the highest leachate chloride predicted leaching concentration was 311 milligrams per liter. Of course, the standard's 500. So you add the predicted 311 to the existing 25-milligram per liter, you would expect a concentration of 336 milligrams per liter. So we continued monitoring groundwater adjacent to this unit for many, many years. And as you can see on the plot, it spiked up to about 550, as the unit -- it had water percolating through it and it eventually compacted and settled in a little bit, and groundwater appeared to approach a steady state of about 325. Well, 325 compared to 336 is incredible accuracy.

Here's the geology of the site. We had a clayey silt with a large mass of salts above it. And I have studied leaching phenomenon, and I can get into that in a bit. But I don't know if Dr. Lloyd Duell came up with this test or what, but this is incredible accuracy. I like the, you know, 29-B test because of this. It's not often you get an actual field study of this type that lasts over this duration under these kinds of circumstances to prove the validity of a method. This is huge validation. And it's required in Chapter 6.

Q. You mentioned Lloyd Duell. He published something on this?

A. No. Lloyd Duell was involved with the -- he was one of the principal authors of the laboratory procedures manual.

Q. Which has the leachate test in it?

A. It does, yes.

Q. Okay.

A. I met Dr. Duell several times, but Jerry Landry was also on there. I worked closely with Jerry Landry for years, back when he went at James Labs and then went to Sherry Labs and now they're Element. So I've worked with Jerry for years and years. Technically, we'd have a lot of discussions about these aspects.

Q. And the next slide, you're still SPLP?

A. So the SPLP chloride test --

Q. What was it adopted for?

A. Well, I can tell you both tests. The 29-B leachate was originally for the type of facility that I was just describing, for testing the leachability of reused material and closed treating material at a commercial facility. SPLP is a test that was designed to simulate leaching at a -- at a landfill. An SPLP utilizes a more acidic reagent east of the Mississippi as compared to the west. So it's designed to simulate leaching from a landfill.

Both tests -- like ERM applies the SPLP to soils, which is not waste material. And I'm applying the 29-B leachate chloride test to soils because it was really designed to test the leaching potential for a constituent, salt, which has one of the lowest KDs in nature. It's salt. Chlorides are not only extremely soluble; they're nonreactive. I've used them as the tracers because they do not react with the aquifer matrix. They're ideal for that. So the potential for salts to leach is much greater than almost any other constituent that's out there.

Q. And for years and years, it's fortunate, not fortunate, you've been able to compare the two actually in the field?

A. Yes.

Q. Okay. Let's go through this slide and the next slides to talk about your experience.

A. So chloride is highly soluble. The

Statewide Order 29-B test is a 1-to-4 dilution. So you essentially have a four-fold solution ratio. It's agitated for seven days to extract it to simulate what leaches out of it.

SPLP uses a 20-to-1 ratio. So that's a much higher dilution as compared to the Statewide Order 29-B, which in itself is not that -- it's -- it provides a lower result but it's an acceptable procedure. It's how that data is then implemented is where the problem comes in. What they're doing is they're taking the chlorides secondary drinking water standard, 250, and multiplying it times an assumed dilution and attenuation factor of 20, and that comes from the Summers leaching equation, which was based on a half acre in size. It was a study done by EPA to try to arrive at a dilution that would occur through a simulated source that's less than a half acre in size to reach the groundwater.

So that results in a comparative standard of 5,000. Well, the sample's already been diluted 20 times, so you would need -- because chloride is so soluble, you would need a starting value of 100,000 milligrams per liter to even begin to exceed a leachate chloride standard.

Well, guess what? Produced water is typically less than 70,000 milligrams per liter, which explains why I've never seen their application of the SPLP for chloride ever fail, ever, in hundreds, if not thousands, of samples. It just never does. As a matter of fact, Wisconsin's DNR guidance, which many other states have followed, makes the statement: "It should be noted SPLP test inherently has a 21 dilution factor. It's the only dilution factor that should be used, unless a much more extensive analysis indicates otherwise."

Q. Next slide.

A. I guess so. So I had an opportunity to do a worst-case test of the SPLP test and apply it, as ERM has done. In Napoleonville, there's a Texas Brine brine storage pit. Texas Brine is in the business of solution mining the salt domes so that they can sell chloride to Dow Chemical, split it up and they use the chlorine to make chlorinated hydrocarbons and solvents and stuff.

So they had a brine pit that had a fiberglass liner under 3 feet of clay. Fiberglass liner leaked every year. I've got a documentation record -- if you're interested, I can provide it -- that every year they had to drain the pond and repair the liners because they were leaking. The underdrain of the liner had chlorides of 213,000 milligrams per liter chloride. Soil surrounding the pit had ECs of anywhere from 154 to 241. That's insanely high. I remember this site. We would extract the cores, put them on the tailgate of the bed, and in less than a minute, the cores turned like white from the salt crystals crystallizing on the outside of the core surface.

MR. CARMOUCHE: Got a hot mic.

JUDGE PERRAULT: Hold on.

A. So chlorides in the groundwater had a high concentration of almost 150 milligrams, 150,000 milligrams per liter. And that was a well that was adjacent to the pit. It wasn't representative of what was directly beneath the pit. SPLP data came back compared to the comparative standard of 5,000. It all passed. This is worst-case scenario, actively leaking brine pit of solution-mined brine, which is way more potent than produced water. 29-B leachate chloride clearly showed a leaching potential.

BY MR. CARMOUCHE:

Q. So applying SPLP with 213,000 milligrams

per liter in a shallow soil --
A. That was in the underdrain water.
Q. Underdrain water.
-- it passed SPLP?
A. Correct. And I've never seen a failure. I mean, have you? You guys look at data all the time. You can't fail that test.
Q. Okay.
A. Which is, in my opinion, why defendants want to run it so badly: Because it eliminates the truth of a potential leaching condition that exists in nature.
Q. And then we have a letter from DEQ and it's on the bottom. And basically DEQ's advising under, I think, the MOU, advising the Office of Conservation that "The plan includes SPLP analysis for several soil samples. Due to exceedances of salt parameters, LDNR may want to clarify the SPLP is according to the EPA method, which is used for RECAP, or if a DNR procedure is more appropriate."
A. Yes. This 1312 is the extraction method for the SPLP, the 20-to-1 dilution. I presented this presentation in a white paper, and I think it was the 2016 proposed RECAP changes. So I went and presented that data to the DEQ. And I

think -- I don't know if that influenced their comments, but they're implying here that the DNR procedure's probably more appropriate for a salt constituent just because of the high solubility. The whole leaching phenomenon is -- it's a balancing act.

I've worked cases in North Louisiana, South Louisiana. You are going to have the highest groundwater concentrations where you have a relatively thick mass of salt-contaminated soils and a receiving groundwater that has a limited thickness, SD. It's all geometry because it's a mass of chloride that is leaching down into a groundwater zone.

In North Louisiana, the MRVA has a relatively thin confining unit. Contaminated soils provide a smaller mass that leaches into a much larger volume of groundwater that's available to dilute it. And as the hydraulic gradient carries that groundwater, the contaminated groundwater receiving the leachate, away from the mass, the higher the gradient, the faster the mass is removed. It's a balancing act. A site with a low gradient can't move the mass of salts in the groundwater as quickly as that with a high gradient.

So really, South Louisiana sites that have, you know, 20, 30 feet of salt-saturated clays where the sodium will hang up because it reacts with the potassium silicate clays, the sodium replaces the potassium, which is why you go to treat SAR and ESP with a calcium amendment to free the sodium from the soil structure and the sodium leaches down into the groundwater. That's pretty much how amending SAR works.

So it's a balancing act. The less thick the groundwater zone is beneath a mass of salt, the higher the groundwater chloride concentrations are going to be. It's -- I've done calculating methods that are within the appendixes of RECAP to demonstrate how little of a dilution is offered when you have a large source size and a very limited groundwater SD variable.

Q. Mr. Miller, before we get to our classification slug tests -- and we'll hit that in a little bit, but we both sat through this whole week. You've read their most feasible plan, Chevron's most feasible plan and comments. Because you can read their comments.

You've read and you've heard this week

how unreasonable your protection and your most feasible plan is, you heard that?

A. Yes.

Q. How crazy of an idea it is; correct?

A. There's just --

Q. I don't know if they used the word "crazy."

A. It's just a whole lot of effort in opposition to our proposed soil remediation that we proposed in response to the limited admission.

Q. So I want to show you a map. And Mr. Sills is going to get into the details of the costs and what needs to be done with the soil.

But show this one. This (indicating).

So for you, for your purpose, the area that -- to protect a drinking water aquifer in Louisiana, you're proposing what needs to be done to excavate to protect it is .17 of an acre; is that correct, Mr. Miller?

A. The blue box represents where we're proposing to address the leachable soils that we identified with Statewide Order 29-B leachate chloride method. So there's a pocket of soils that represent a leaching potential, and that is our estimated extent of what we're going to do to

address it.
Q. Let's recap.
So you've got a Class 2 aquifer. I think, almost, Mr. Angle agreed yesterday, it's hydrologically connected to aquifers. You have undoubtable contamination because they admitted contamination. You had to come up with a feasible plan to protect the aquifers of Louisiana, and your feasible plan to protect the aquifer that they call unreasonable, unnecessary, destroy the ecology is .17 of an acre?
A. Correct.
Q. Okay. Let's move on.
PANELIST OLIVIER: I do have one question. This is Stephen Olivier.
So I know that SPLP and leachate were both conducted on data sets by different parties. And just for my reference, could you point me or could you just -- do you remember the sample location where the leachate test exceeded criteria?
THE WITNESS: It's -- if you look at our table 1, soil data summary, we've got a header in there that has the 29 leachate chloride standard of 500. And we'll have

shading wherever an exceedance was noted.
PANELIST OLIVIER: Do you remember which data point the leachate exceeded?
THE WITNESS: If we can go back to cross-section A, A prime.
Let's see if I can go back to it, if Scott will let me do this.
Scott, can you get cross-section A, A prime?
PANELIST OLIVIER: You might have pointed it out earlier. Was it H-16?
THE WITNESS: I think so.
PANELIST OLIVIER: That was it.
THE WITNESS: That's where I had those soils delineated, I think, in a blue polygon.
H-16. And if you look, while we're on this slide, you can see the conductivity log response, how elevated it is where we have those source soils in between the 10 and 18 feet -- 12 and 18 feet. So the lab data and the conductivity log are in agreement --
PANELIST OLIVIER: Okay. And --
THE WITNESS: And we've got 11,900-milligram-per-liter chlorides in the underlying groundwater.

PANELIST OLIVIER: And, notice, now that we're back on this same diagram, earlier, I know you mentioned that y'all were going to propose three different deep monitoring wells, I think, at H-12.

THE WITNESS: Around the crater; correct.

PANELIST OLIVIER: Okay. Is there currently any existing -- or do you recall any existing data exceedances below this area here where it's shown as 39,200 chloride levels?

THE WITNESS: There are soil samples that show, as does the conductivity log, decreasing soil EC -- and I think EC is all that was run on those -- to below what would represent a leaching standard. But it goes down, then it bumps up a little bit and drops back down. So at least between a depth of, I think, 70 and 76 feet maybe, with the chloride profile decreases.

PANELIST OLIVIER: Okay. So it shows a decrease around 75 feet of ECs?

THE WITNESS: Generally. Yes. We don't know what happens deeper. Because we're seeing a similar drop at the top of H-12 between 20 and 30 feet.

PANELIST OLIVIER: Okay.

PANELIST BROUSSARD: Gavin Broussard. Along those lines, then, I guess can you point me to what data you are using to come up with the theory that it may be bottom-up?

THE WITNESS: It's the lack of residual elevated chlorides above this permeable zone. So when you see concentrations approaching 40,000 milligrams per liter 80 years later, this is just based on my experience, and it comes from a surficial source, there's going to be a pretty strong residual contaminated profile above that water-bearing zone. But then again, a crater flooded with freshwater is probably inducing some flushing at the same time, which could have an effect.

The presence of benzene in that zone that's still here after 80 years is troubling because benzene is subject to biodegradation. And the fact that we're still getting it 80 years later in a well at that depth, it's troubling because it should be gone by now unless there's a continuous feed-in.

PANELIST BROUSSARD: To understand the bigger picture of that particular spot, have we found any or have you come across any record or indication that, one, during the blowout, that intermediate casing -- now, I understand you're not an engineer, but the intermediate casing was compromised and, if so, did that surface casing see the pressure of the Kincaid before the blowout?

Because -- I'll let you answer. Go ahead.

THE WITNESS: I did see more engineering descriptions of what was occurring during the early stages of the blowout in the Watkins versus Gulf case history, which I've got a copy I'll be glad to leave with you so that you could take a look at it. And it's got more of the engineering aspects of what they were fighting in the early days of the blowout.

PANELIST BROUSSARD: Sure.

THE WITNESS: I can give that to you right now, if you'd like.

JUDGE PERRAULT: Wait, what have you handed him? Let counsel for Chevron see what you're handing him.

MR. GREGOIRE: He's handing him a case and so it's a reported case. I know what it is.

JUDGE PERRAULT: Okay.

MR. GREGOIRE: It certainly does not have an official engineering analysis. The panel should understand that. It's a cited case from at least 50, 60 years ago.

JUDGE PERRAULT: Okay.

Are you going to offer it as an exhibit?

MR. CARMOUCHE: I will, Your Honor. We'll offer it as Exhibit -- we'll offer it as VVVV, four Vs.

JUDGE PERRAULT: Four Vs? Vs as in victory?

MR. CARMOUCHE: Hopefully.

JUDGE PERRAULT: No objection to Exhibit VVVV?

MR. GREGOIRE: No objection.

JUDGE PERRAULT: No objection. It shall be admitted.

PANELIST BROUSSARD: I think -- I think you've answered the questions I have. Yep.

THE WITNESS: It's an interesting read.

PANELIST BROUSSARD: Thank you.

BY MR. CARMOUCHE:

Q. We're going to run through quick. I don't want to spend a lot of time on barium, dry and wet weight. Just run through the information you gathered and why it exists that your bariums are a little higher than Ms. Levert's or Angle's.

A. I don't want to spend a lot of time on this either. This Lloyd Duell paper -- if Scott could bring it up -- is probably one of the best synopsis of what you guys deal with with the barium issues. 29-B was promulgated in '86. Between '86 and 1990, there was no true total barium test. It was SW-846, just total barium that was run. And the whole subject matter of this paper is that Bill Freeman with Shell had noted, as well as other operators, that when they would go to do an on-site closure of pits, that oftentimes, after they would bring in dirt and mix it for on-site closure, that some of the barium results would increase after mixing, and it was driving them nuts trying to figure out what was going on. And that's even with -- as shown down here, that they were using, at the time, drying and grinding operations, which are consistent with the dry-weight barium that we run today at the lab because it represents a more representative subsample and it's easier to extract.

Even with that, he recognized there were issues going on so he tried to -- he did a study and correlated the barium -- the results they were getting to things like pH, chloride, redox potentials. And what he determined is that the one criteria in a statistical evaluation that made the most difference was the total mass of barium that's present in a soil because that barium, he was concerned about becoming available in a more soluble form under reducing conditions. And so he developed -- he suggested in this paper the true total barium test, although he suggested a higher criteria but it's not one that -- 29-B ultimately went with a different criteria, but this was sort of the basis behind the true total barium test.

THE WITNESS: If we can go a few pages down.

A. This is what I just wanted to kind of focus on because I've heard all this discussion on barium. As you'll see, he's showing that the barium is getting concentrated in ferromanganese nodules. These are commonly what we'd call siderite nodules that are prevalent in core samples that we find all the time. Sort of a tannish-white-looking nodule that's an iron carbonate that he's saying the barium is concentrated in those hundreds of orders of magnitude higher than in the surrounding soil.

Well, part of the method of preparing soil samples excludes these nodules, so even with all of the arguments going on about the barium results, which I don't want to get into, I just wanted to point out, even the analyses that we're getting out of the labs exclude that mass of barium that remains in the subsurface because the method excludes it by a screening process.

BY MR. CARMOUCHE:

Q. So is it your opinion that both yours and Ms. Levert's is a conservative reading of the barium?

A. It's -- it's -- it's an underestimation of the total mass of barium that exists in nature in the subsurface. I mean, as far as the accuracy of what they're measuring in the matrix itself. I mean, the main issue we like to run dry weight is because it eliminates the bias caused by variable moisture concentrations. Because if a sample has 50 percent moisture, its concentrations are half of what a dry weight sample would produce. So it removes random bias, which is why I like to do that.

But even in correcting the solubility,

there's differences in how much you can extract from a dry sample versus a wet sample, which the method clearly states, as I think the next slide might allude to.

This is method 3050B, which both ERM and ICON, their laboratories both utilized this to prep in the analysis and the metals analysis, and they're clearly stating the method is not a total digestion for most samples. It's a good one. It gets most of the bioavailable, but it's not total. So it introduces a degree of randomness to it. This method also discusses the method of screening out larger particles, such as these nodules, so you eliminate that. And then let's see.

And this is in the method. It can be difficult to obtain a representative sample with wet or damp materials. They recommend that they could be dried, crushed or ground to reduce subsample variability. This is the same thing that Dr. Lloyd Duell was discussing in his paper. It's just, in the prep method, you get a more representative sample if you dry it and crush it. And Ms. Levert's right, it increases the surface area to extract more barium, but then you've got to ask yourself: Which one is most representative of what's out there? You're already eliminating the nodules. And I'm just saying from -- at my old age, from doing environmental assessment all my life in these -- in Louisiana, that arsenic and barium are confounded by redox conditions.

Reducing environments change totally the species available for both arsenic and iron -- arsenic and barium. And iron as well in a reducing environment. It makes it difficult.

MR. CARMOUCHE: Judge, before -- we're going to -- if we could take a ten-minute break, I might be able to run through this faster.

JUDGE PERRAULT: Let's see. It's 11:00 o'clock -- so it's 11:01, so we will take a break till 11:11.

And we are off the record.

(Recess taken at 11:01 a.m. Back on record at 11:22 a.m.)

JUDGE PERRAULT: We are back on the record. It's February 9th. It's now 11:22, and counsel for Henning is continuing his direct. Please proceed.

BY MR. CARMOUCHE:

Q. Mr. Miller, you filed a most feasible plan; correct? ICON filed a most feasible plan?

A. Yes. Well, we followed what the regulations require in the feasible plan.
Q. Right, but you submitted a most feasible plan?
A. Yes.
Q. Okay. And to do that, you had to comply with Chapter 6, 6-11.
A. Yes.
Q. Can you show that?
It states: "Commissioner shall consider only those plans filed in a timely manner" -- which you did; correct?
A. Yes.
Q. -- "in accordance with the rules" -- which you did; correct?
A. Yes.
Q. -- "and orders of the court"; correct?
A. Yes.
Q. So as per the provision in Chapter 6 that you have to follow to submit plans, you have to follow, according to this, orders of the court?
A. Yes.
Q. Okay. So I -- you've seen the order of the court; correct?
A. I have.

Q. Okay.
So let's go to the order that you have to follow. First, let's go to this.
"Contamination," that is also in a definition that you have to follow because Chapter 6, it says it has to be in accordance with 30:29; correct?
A. Yes.
Q. Is the word and the definition of "contamination" confusing to you?
A. No.
Q. And the definition says: "Contamination" -- which they've admitted -- "shall mean the introduction or presence of substances or contaminants into a useable groundwater aquifer"; is that correct?
A. Yes.
Q. We have a useable groundwater aquifer here, in your opinion?
A. Yes. Supported by -- particularly by the slug test data in the B bed, which is only the lower part of the aquifer.
Q. Or soils -- which that's going to be Mr. --
A. Sills.

Q. -- Sills.
A. Yes.
Q. And it's your opinion that the groundwater is not suitable for its intended purposes?
A. Yes.
Q. Okay. That's your opinion. Okay.
Now, let's go to the judge's order, which you have to comply with as a scientist. "LDNR shall approve or structure a feasible plan incorporated in the court's filing that, as a result of Chevron's limited admission, Hennings' property contains contamination and it is not suitable for its intended use." That is the order that you have to follow; is that true? And that's what Chapter 6 says; correct?
A. Yes.
Q. "Ultimately, based on the court's finding of contamination, the public hearing and the parties' submitting plans, LDNR shall, within the time frame permitted under Act 312, submit to a court a feasible plan to remediate contamination."
A. Yes.
Q. So the court's order that you have to

follow says that your plan and other plans have to remediate a usable aquifer that can't be used for its intended use? Did I read that correctly?
A. Yes. I've been a bit confused all week. I thought that's the whole purpose of this hearing is to pick a remediation plan because Chevron admitted environmental damage.
Q. But that's the court order. You're following not only your opinion under Chapter 6 but you're also following a court order from a federal judge?
A. That's correct.
Q. Which is required by Chapter 6?
A. Yes.
Q. Okay. All right. Let's go to classification and yield. Take us through your slug testing and your RECAP classification, please.
A. Okay. So this page here, what I did is I separated data from the A bed of the aquifer from the B bed of the aquifer to facilitate the most feasible plan to remediate groundwater because had I not done that -- I was concerned about tailing effects. And so the intent here is to -- is to be most efficient in extraction of the

chlorides, which is not a difficult thing to do in a groundwater remediation because they're -- chlorides are unreactive. You just have to properly design and pump a remediation system.

But if you didn't pay attention to the geology or what it is, the whole conceptual site model, you would end up with potentially putting a well through the A bed and the B bed where they both concurrently exist; and in such a recovery well, it would take -- it would get most of its water from the most permeable bed in the aquifer, which would be the B bed because it's obvious the B bed has a much higher conductivity as compared to the A bed. If that were to happen, then the well would decrease in concentration and then flatline because it's going to take a longer time for a lower-permeability A bed to bleed its chlorides into the recovery well. They call it a tailing effect. So if you don't really isolate that, it makes it much more difficult to efficiently extract and hit the target contaminant.

So I segregated the data from the A bed to the B bed to facilitate the design of the extraction system. And so it kind of -- our plan is based on 29-B without exception; so in other words, we're not proposing to use a RECAP standard because my background data is elevated, even though I think it's more elevated than what naturally exists out there because we've got five wells around the AOIs that are less than 250. So I think my background area is reflecting some effects from the -- probably the blowout fall-out because that just went on for such a long time over a large area. Nonetheless, I stuck with it to provide a basis for the pore volume flushing estimates.

But the data clearly shows A bed is less permeable. The B bed, taken by itself, clearly meets the RECAP definition of a GW-2. And you've got to focus on the GW-2 definition. It's an aquifer that yields water to a well. Nowhere in RECAP does it say you take an average of yields in an aquifer. Because then you start getting into, know, statistical manipulation. Like I easily could have tested the well with 40 feet of sand to bump up my mean of the yield at the site. It creates a situation where you can start picking and choosing data to get a result that you want.

And I think RECAP, when they wrote it,

you know, Steve Chustz was the primary author, and he's a friend of mine. I think he had the foresight to see the problems that would get -- get you into. So the definition clearly states "the yield to a well," which is important. There's some aquifers around Pineville that are -- they're fluvial and they pinch out when you get to the Red River Holocene sediment. So the aquifers are long and lenticular. They're not laterally continuous, but they are in parallel to the Red River.

And you can then start trying to play statistics by picking wells where the aquifer is really thin at this point of being pinched out and manipulate statistics any way you want to. On the other hand, it's important to look at more than just one slug test data. You've got to have enough so you can predict the sustainability of a yield. Because that's part of the definition, is maximum sustainable yield to a well. So if you can prove that, that forms the basis for groundwater classification.

Q. And can you prove that?

A. Yeah, I looked at, again, back to -- here's -- on this page here, again, RECAP says:

"When averaging a number of hydraulic conductivity results, use a geometric mean." The geometric mean, I did one for the B bed and one for the A bed. You then take that geometric mean and use that as a basis for all of the calculations that we did. In this particular cleanup plan, we actually used the Theis Nonequilibrium Spreadsheet. So it's -- RECAP has the Cooper-Jacob approximation to the Theis Nonequilibrium Equation, where it makes some assumptions. Part of those assumptions is you're limited to 75 percent of the confining head. If you look at the footnotes in RECAP, it will say you're limited to .7 or .75 of the confining head, which leaves a lot of available confining head that you could stress a well harder and get a higher yield.

So for our recovery system, we actually went to the Theis Nonequilibrium Equation where your -- the duration of pumping and the rate of pumping all go into predicting a draw-down in a given well, which is the foundation of a predicted yield to the radial flow to a well.

So a geometric mean, in this instance, when you're looking at -- let's use this to -- to classify an aquifer. All of the geometric mean data for the B bed gives me a yield of 2.3 feet per day. I take the average thickness in all of the wells comprising the data set and an average confining head, run it through the Cooper-Jacob Approximation Equation, which is in RECAP but you're not limited to those equations in RECAP. Nonetheless, I used it. And I come out with a yield of 1,131.

In these tables up here, what you see on the right-hand side are individually calculated yields and then a number of summary statistics that I'm throwing out there of evaluating the yields. Because nowhere in RECAP does it say to take the geometric mean of the yield. It says to take the geometric mean of the hydraulic conductivity. And there's a big difference there. Hydraulic conductivity can vary by seven orders of magnitude. It's log-normally distributed sometimes, but it's a much larger range than a range in years.

So following the protocol within RECAP using the slug test data, I come out with 1,131. When you look at the summary statistics on the second half of the summary table up here, individually calculated yields exhibited a geometric mean of 948, an average of 1,893 and a median of 1846. I went through USGS literature nationwide looking to see if they ever described a geometric mean of a yield of an aquifer and never could find it. It's just that's not a term of art that is used in our industry to describe an aquifer.

Most of the published cases discuss a range in yields that can be available. Doug Bradford has a bunch of publications on the MRVA for North Louisiana. He discusses a range in-yield. That's different from RECAP groundwater classification. So I'm confident that the B bed alone meets the definition of a GW-2.

Q. That's what I was about to say. So you combine -- which everybody agrees, the A bed that is hydraulically connected, you get more water?

A. That's correct.

PANELIST OLIVIER: I do have one question. Stephen Olivier. I thought I heard you mention that in the court orders for RECAP -- and correct me if I misheard you -- for groundwater classification, it's a sustainable yield that it has to meet.

THE WITNESS: That's correct.
PANELIST OLIVIER: So does RECAP define "sustainable yield"? Does it give a definition of how you calculate the sustainability to show that it meets those requirements?
THE WITNESS: Not specifically. It can be done -- I'll tell you, the way I did it with this data set, is --
BY MR. CARMOUCHE:
Q. Let me -- can I just lay that foundation?
Is what you did and the methodology you use, has that been accepted by DEQ? I mean, the sustainability?
A. I mean, in the sense that the -- the point that I made earlier is that they want to see multiple slug tests so that they can get a feel for the range of the values. So in that instance, yeah. That's a pretty standard thing.
Q. Have they approved even one well to classify?
A. Yeah, I mean, I gave Mr. Gregoire a whole folder of various projects over the last 20 years we submitted to DEQ, and there's a wide

variety of what went down to get these sites classified. This is not litigation-related. This is just our normal day-to-day stuff.

More often than not, it's based on a single slug test value. Sometimes we've done multiple slug tests. I remember an instance where we looked at the highest result of those slug tests. Couple of sites, we didn't even test the site at all; we just used data from a nearby site.

A lot of those instance are where we're not at a threshold criteria. So like right around, you know, between a GW-2 and a GW-1 or a GW-3 and a GW-2. Normally, if your yield comes out a solid 1500, 2,000, it's a 2. Hell, we've got a bunch of those at the B bed of this aquifer. If your yields come out, again, like the A bed where some of them are a couple of thousands, some of them are really low, that's when you've got to start taking a hard look at how representative the well installation is, how -- what the -- you know, what's an accurate yield? Which gets back to your method of saying maybe a pumping test in those situations would be warranted.

PANELIST OLIVIER: Well, I guess, based on your experience, have you -- or can you recall a situation where DEQ maybe has made a decision on a groundwater classification based on sustainability of a yield?

THE WITNESS: Not that I recall in one of my projects. I remember one instance where we were looking at the potential influence of a surface water body influencing the results of a pumping test, where they say that could affect the classification as well, which it's -- I've got my own opinions about that. Basically if pumping a well induces infiltration of surface water, that's a part of the natural recharge of the aquifer and should be considered. But I can't remember specifically, you know, that -- it -- really, it's kind of a practical thing. If you get a very high predicted yield surrounded by a bunch of very low predicted yields, that is indicative of probably a condition where you couldn't sustain a long-term yield. And, that's what I did in this case, is I looked at the distribution of yields, the predicted yields, in the B bed; and as we saw earlier, they were all very, very high throughout the B bed and one, we had 600 GPD range. Other than that, they were all in the thousands. Some of them were 5,000. Some of them were meeting GW-1 yields, which gave me the confidence that we have lateral hydraulic conductivity sufficient to provide recharge to a pumping well. That goes to the sustainability of a pumping well in that zone.

PANELIST OLIVIER: So from what I understand, based on your slug test, because you had such, I guess, a higher number of individual wells, with that higher, you know, gallons per day pumping rate, that gives you confidence that the sustainability will be there just because of all the surrounding wells you have?

THE WITNESS: That's correct. And the knowledge from an isopach map that we're dealing with a channel-filled deposit that really gets thick, you know, towards the bayou, which is probably a source of recharge to some degree, although our natural groundwater flow in that area was towards the bayou. So those are considerations. But under a public well scenario, it would induce groundwater flow. So yeah, hydraulic conductivity is laterally continuous enough to sustain that type of a yield, in my opinion.

BY MR. CARMOUCHE:

Q. What did you do in Hero Lands, Mr. Miller?

A. Hero was a bit different. That was -- we had two aquifers out there, one of which had been heavily regulated by the DEQ and had been classified by the DEQ as a GW-2.

Q. And --

A. So I relied on DEQ's regulatory history on that site of that particular shallow aquifer for its groundwater classification.

Q. But yet what happened in the most feasible plan? Did you have to do a pump test?

A. There were comments submitted to the DNR panel, as I recall, from DEQ that gave their opinion that the B zone, is what they called it, was a GW-2. For whatever reason, the panel chose not to incorporate those comments.

Q. Let's move on.

So Mr. Angle decided to -- when he opined that it was a Groundwater 3, what did he do?

A. Well, he didn't develop a geologic model. He just kind of threw all of the data together and did in one statistical pool.

So, as he said yesterday, he just pooled all of his arithmetic means for the individual wells into a geometric mean calculation.

Q. Okay. So he took a geometric mean of the estimated yield of each well? Did I get that right?

A. Yeah. Irrespective of the geometry of the groundwater system. So it's just -- it's sort of a blind application of data thrown into a statistical pool that doesn't really describe reality.

I mean, if you really look at what the shallow aquifer is primarily comprised of, it's got two sinuous, permeable channel fills that that's where most of the permeability is, but the HPT logs clearly show that the interstitial clays between those also have permeability because the logs indicate we were able to pump water into them. And so if you put a fully penetrative wall, there's going to be a little bit of contribution of the water from those as well.

But when you look at just the real distribution of the predicted yields that really describe the hydrostratigraphic units that are out there, there's no doubt the B zone of the aquifer is exhibiting much higher yield that easily meets a GW-2. And to that, you add additional yield of the A bed and the clays will get your yield even higher. So again, you've got to be careful, playing with statistics, that it's describing what you're trying to describe with the statistics.

Q. All right. Let's go to more evidence of the classification. The guidelines.

A. Yeah. Scott and I are competing.

There we go. You guys are probably overly familiar with this, but this is the 1986 EPA guidelines. Because back in those days, back when RCRA and CERCLA was fairly new regulations and there were questions about at what point do you regulate an aquifer. So the EPA had to come out with guidance. That's what this document does. This is the summary of it in the back, that they selected 150 gallons per day as what should be determined an aquifer of value to protect with the regulations.

It's this -- these guidelines have

permeated every state's groundwater classification scale. State of Texas, TCEQ, 150 is what they use for a usable aquifer. Louisiana said that our 800 GPD is the median of what is presented in this document, as the next page shows. You look down, Number 3. "The 800 is the median yield for a USDW as defined by EPA," and they refer to groundwater protection standards.

So I use that EPA document quite a bit when we have sites that are not under regulatory oversight for whatever reason, there's not a regulated facility or activity going on on the site. And I've got to defend why I might consider that a potential source worthy of being used. Well, I rely on that 150 as a national standard that has been chosen to select at what point do we protect a groundwater resource?

And I know it sounds hokey right now because we're a water-rich state, but when you get to states that are not water-rich, it is a very heated argument that it's going to -- that whole argument is going to touch Louisiana probably sooner than we think.

Q. Greg, so we can move on, with all of the analysis you've done, is it still your opinion that the groundwater, shallow groundwater, continuous hydrologic water-bearing zone is a Class 2?

A. Yes. And it's absurd, but it confirms Chevron's limited admission.

Q. Okay. Let's go to the background of chlorides. We'll skip over that -- yeah, let's go --

A. So as I said earlier, our plan is relying on background. So I used this pool of wells in the background data set. We got elevated results with a mean-plus-1 standard deviation, you know, with normally distributed data for about a 90 percent confidence interval. And we have elevated chlorides, I believe higher than what is truly existing normally out there absent historical E&P activities. And I say that because we have five wells around the AOIs that were less than 250. All of these wells were in the lower elevation eastern portion of the property where site runoff accumulates.

I can't sit here and tell you why or where those elevated chlorides are coming from in that area other than the blowout fallout is -- really confounds trying to locate a suitable location for background. And we do have -- part of our plan is to go out and try to do another background determination. But nonetheless, we used this target here as a target for pore volume flushing estimates, which Jason will cover.

Q. But go to the next slide.

And you -- you're looking at 400 something. Let's look at the data. I think you talked about it already. You have pockets of contamination that have migrated, but also you have areas in the area that already indicate that the shallow groundwater's below 250?

A. Yes. And it's like on the upgradient side of this groundwater chloride plume on figure 18, the upgradient wells are like 57, 62, 22. That -- or 221, excuse me, 156. These are all hydraulically upgradient.

We don't have delineation to 250 down-gradient, although we do have delineation to our calculated 428. Don't have delineation northwest of MW-4.

Q. Which means the contamination could be larger than what you've indicated to remediate?

A. It could be, yes. And that's the down-gradient direction. And on this particular figure, if you'll notice the red spots, the wells with the red spots are the ones that are screened in the B bed of the aquifer. Those with no red spots are screened in the A bed.

And again, we're mixing and matching the wells in both of the beds because this is considered a single aquifer. But there could be differences in contaminant migration in the two respective beds.

Q. And within your 80-acre remediation we'll run through, you've drawn plume maps of other constituents that will be included in the remediation?

A. Yes. There's like barium, which is around -- you know, the crater, cadmium. Cadmium is a metal that doesn't naturally occur. When you find cadmium, there's usually an industrial anthropogenic source. Strontium co-occurs with chlorides oftentimes. Radium often co-occurs with barium. Radium co-occurs with salinity. Total petroleum hydrocarbons, which we used the mixtures because you can use mixtures to -- qualitatively, whereas fraction data are compared just for risk-based purposes and don't provide you with a chromatograph to evaluate the potential source of the hydrocarbons.

Benzene was present around the crater. So...

Q. And this is your proposal?

A. What this is -- this is my involvement in the remediation portion of our plan. What I did is I looked at -- I looked at the whole contaminant plume as my plume maps are drawn, figured out which ones are in the A bed, which ones are in the B bed. I overlaid it with my isopach maps to get a thickness, so each polygon represents a certain average thickness. It represents the constituents of concern that we need to address and whether it's an A bed or a B bed, the geometric mean of the hydraulic conductivity is what was used for that given polygon in the pore volume flushing estimates. So it gave us a way to model a groundwater recovery efficiently and to account for variations in beginning contaminant concentrations, potential yield and the mass that we had to treat.

So we put this together. We've got about 85 acres of surface area. Jason will get into how we went about running through the Theis Nonequilibrium Equation sheets, and I think we've got roughly 400 wells in this 85-acre area, which is about five wells per acre.

So just to give you a little comparative analysis, our typical corner gas station sites are about a half-acre, typically. And we typically have anywhere from six to 12 recovery wells on that half acre. And our budgets from the state -- you know, UST trust funds run generally between a million and a million and a half to complete remediation of those half-acre facilities.

So you know, our five well per acre is -- compares favorably well and pretty efficient as compared to a gas station site, where we have anywhere from six to 12 wells for half an acre. So it's in that same realistic ballpark. I was surprised to see ERM's hypothetical plan where I think they've got one well per 3 acres, which is -- that, I can see why it's not feasible. There's no way you could recover anything with one well in a 3-acre area. We would never do that in a recovery project.

Q. That's part of the difference in the cost. The other is they were injecting the recovery water, the recovery water directly into the soil?

A. Correct. And you know, I've been involved in -- like I said, we did that pump and treat for Dynamic. We recovered, I think, maybe 3 million gallons and blended it with produced water to make it compatible with the injection formation. We did groundwater recovery at the Tensas landfill to address chloride and sulfate with a target of background, and that recovered water was blended in their oxidation pond to meet their discharge requirements.

The Reliable facility, we inherited that facility with an ongoing chloride groundwater recovery project.

Q. For chloride?

A. For chlorides. With another background remedial standard. And that water was blended with it. Because it was a commercial facility, so they were receiving large quantities of produced water that they could blend and keep it compatible.

Q. So we're about to end.

The Dynamic site, you said that was, what, 3,000 feet?

A. No.

Q. Where was the aquifer?

A. It was at about a depth of 1700 feet. So our assessment wells had a TD of a little over 2,000.

Q. Were there aquifers above that aquifer that were usable?

A. Yes. Probably ten or 12, somewhere in there.

Q. Ten or 12 useable aquifers that a landowner could use above the 1700-foot layer, and the Office of Conservation made you clean that aquifer, even though there were other aquifers, made you clean it to background?

A. Yes. And we were able to achieve chloride. And that was a convoluted recovery project because we converted the injection well into a recovery well, but one of the assessment wells was also contaminated, and we converted it to a recovery well. But we were able to achieve background chlorides before we were able to achieve background benzene. Benzene was lingering. I lost involvement with the project, like I said, about five years ago. But Steve Lee said it was still plugging along.

Q. Mr. Miller, you reviewed the -- I'm just going to run through some things you relied upon.

We looked at, earlier, the court's ruling on our motion, you saw the order. You saw the Chevron and relied upon the Chevron admission?

A. Yes.

Q. You relied upon and you were part of and -- the Hennings' most feasible plan that was submitted?

A. Yes.

Q. You also developed, with others, ICON comments to Chevron's most feasible plan?

A. Yes.

Q. You relied upon -- to give your opinion, you relied upon the 2007 Hawaii BTLM guidance that's in the binder?

A. Yes. That had to do with the leaching in SPLP, correct.

Q. You relied upon SLP Nevada for the evaluation of soil leaching?

A. Yes.

Q. That's not the sole thing but --

A. No, that's correct. I looked at many states.

Q. And you relied upon or considered, in giving your opinion, the specific impact to groundwater remediation standards?

A. Yes.

MR. CARMOUCHE: Okay. At this time, Your Honor, I would offer, file and introduce into evidence Plaintiff's Exhibit B as in boy, C, E, G, BB, GG, and HH.

JUDGE PERRAULT: E, we already have in evidence.

MR. CARMOUCHE: Okay.

JUDGE PERRAULT: So Henning is offering Exhibits B, C, G, BB, GG and HH.

Does Chevron have any objection to Exhibit B?

MR. GREGOIRE: No.

JUDGE PERRAULT: No objection. So ordered.

To Exhibit C?

MR. GREGOIRE: No objection.

JUDGE PERRAULT: No objection, so ordered.

To Exhibit G?

MR. GREGOIRE: No objection.

JUDGE PERRAULT: No objection, so ordered. It Shall be admitted.

To Exhibit BB?

MR. GREGOIRE: No objection.

JUDGE PERRAULT: No objection, so ordered. It shall be admitted.

To Exhibit GG?

MR. GREGOIRE: No objection.

JUDGE PERRAULT: No objection. So ordered. It shall be admitted.

And Exhibit HH?

MR. GREGOIRE: No objection.

JUDGE PERRAULT: No objection. So ordered. Shall be admitted.

MR. CARMOUCHE: I'm finished.

JUDGE PERRAULT: You're finished with this witness? It's 12:01. Do y'all want to have a lunch break and come back at 1:01?

MR. CARMOUCHE: That's good, Your Honor.

JUDGE PERRAULT: All right. We're in recess.

(Lunch recess taken at 12:01 p.m. Back on record at 1:02 p.m.)

JUDGE PERRAULT: All right. We're back on the record. It's now 1:02 on February 9th, 2023. We've just had our break for lunch in the Henning case, and we're going to start the cross-examination of Mr. Miller.

Please proceed for Chevron.

CROSS-EXAMINATION

BY MR. GREGOIRE:

Q. Yes. Victor Gregoire for Chevron USA.

Good afternoon, Mr. Miller.
A. Good afternoon.
Q. We've met before, haven't we?
A. Yes, we have.
Q. I want to first start today by talking about some things that you do not know, okay, and that you have not done, and then we'll proceed from there.
You never spoke with the landowner; that is, Mr. Tom Henning, before you produced your proposed most feasible plan?
A. That's correct.
Q. And when I say "your," I mean ICON's; is that right?
A. That's correct.
Q. And I deposed you right after Thanksgiving of last year, November 2022, and you still hadn't talked to Mr. Henning at all about your plan or about this property; is that right?
A. That's correct.
Q. So you haven't talked to him at least up until the time I took your deposition about this property and about any of the reports and plans that you have produced in this litigation; is that right?

A. At that time, that's correct.
Q. You have not spoken with anyone who has performed any type of activity or currently performs any type of activity at the property, including farming, raising of cattle, hunting or any kind of other recreational activity; is that right?
A. Not to my knowledge, that's correct.
Q. You did not have any prohibition against doing that, had you wanted to do it; is that right?
A. I have no idea.
Q. No one stopped you from going into the property or asking Mr. Henning: Can I talk to some folks who may perform some recreational and agricultural activities on this property?
A. I didn't ask for such access, so I wasn't denied.
Q. You would agree that rice is the only crop that currently is grown or harvested on this property?
A. I really didn't make that evaluation. I know that that's the predominant crop on the property in this area, but I didn't evaluate it for anything else. It was intentional.

Q. You visited this property one time; is that right?
A. In purposes of this case; correct. I've driven through it numerous times. I used to duck hunt down there, so...
Q. And when you visited this property in connection with this litigation in this proceeding, the only crop that you knew that was grown on the property at that time was rice?
A. That's correct.
Q. You have no knowledge of any other crop that has grown on this property for at least 50 years other than rice; is that right?
A. Other than what was described in the Watkins case. They discussed cotton as well as watermelons, truck crops, that type of stuff, but that's the only other source that I've seen.
Q. You don't know whether cotton or watermelon had been grown and harvested at this property for the past 50 years; is that right?
A. I just don't know, that's correct.
Q. You're talking about the case that you supplied Mr. Broussard earlier, the Watkins case; is that correct?
A. That's right.

Q. And that's the case that described the 1941 blowout; right?
A. Yes.
Q. So you're talking about the potential growth of watermelon as a crop dating back to 1941, so we're talking 82 years ago?
A. That's correct.
Q. Okay. Neither you nor any of your other colleagues at ICON -- I know we'll hear from Mr. Sills and Mr. Prejean -- are qualified to render any opinion in this case about the root zone or effective root zone of any vegetation or crop that currently grows or has grown on this property?
A. That's correct.
Q. Similarly, you're not qualified as --
A. Well, let me qualify that. Other than what is in the published literature, but not specific to this property. We've consulted public literature a lot on the rooting zone. And there's a lot of it out there that applies to Louisiana but not this property specifically.
Q. And when I took your deposition back in November of '22, you admitted, if you recall, that you're not qualified to render an opinion about

the root zone or effective root zone of any vegetation or crop that currently grows or has grown on this property?

A. That's correct.

Q. Similarly, you're not qualified to render an opinion in this matter about the root zone or effective root zone of any vegetation that may grow on this property in the future?

A. Other than the knowledge of the existing root zone of plants that I'm familiar with that get planted. But I can't predict, after you plant them, how much larger the root ball will grow. But I know that there was a photo that I took of the oak tree that had a 4 1/2-foot-deep wooden container. I personally purchased five trees from Mr. Ducote, and it's a 4 1/2-foot-deep root ball at the time of planting, which is bound. I can't tell you how much larger it gets, but at the time of planting, it goes down 4 feet.

Q. We can agree that you're not a soil scientist; right?

A. That's correct.

Q. And we can also agree that you're not an agronomist?

A. That's correct.

Q. And we can also agree that you're not an arborist?
A. Correct. I'm familiar with a chain saw and I plant pecan trees, though. So I'm familiar with those.
Q. You have not rendered an opinion in this case that this property in its current condition cannot be used for agriculture?
A. I didn't make that evaluation.
Q. You have not rendered an opinion in this case that this property in its current condition cannot be used for hunting?
A. I didn't make that evaluation.
Q. You haven't rendered an opinion in this case that this property in its current condition can be used for farming?
A. I have not made that evaluation.
Q. And you haven't rendered an opinion in this case that this property in its current condition cannot be used for residential use?
A. I have not made that evaluation, that's correct.
Q. So let's move to your slide deck, or your presentation that you testified about this morning.

MR. GREGOIRE: And if you can, Jonah, let's move to Greg No. 7.

BY MR. GREGOIRE:

Q. So this figure -- which is figure 15 from your proposed most feasible plan; is that right?

A. Yes.

Q. And that shows the GEM readings that you and/or your colleagues at ICON took at the Henning site; is that right?

A. More specifically, it shows the transects that were walked.

Q. And the transects that were walked, does it show any terrain conductivity readings on it?

A. It does, yes. I think it will be -- and this is a very poor copy, and I'm not sure what frequency is being shown. But it's probably the 1170 hertz frequency and the color codes of each individual dot on the transects are the same color code on the scale of the contours.

Q. I'm going to lead you to Area 2. Of course, we know that's the area where the blowout occurred; is that right?

A. Yes.

Q. And that's this area here (indicating)?

A. Yes.
Q. We see no anomalies, at least in the shallow frequency, in those transects; is that correct?
A. I can't see the colors on it.
Q. It's your chart. It's your figure.
A. But it's a poor quality.
Q. Advance -- do you see or don't you see any anomalies in that -- (indicating) the shallower surface area of that blowout location?
A. I can't tell at this quality picture. Sorry.
Q. Let's move to the next figure.
So the next figure brings us -- gives us a little bit of a deeper frequency; is that right?
A. That's the 1170 hertz contours; correct.
Q. Let's go back to the blowout area. Area 2; is that right?
A. Yes.
Q. And you said earlier you'd want to look for the orange and red-type areas on your GEM frequency; is that right?
A. That's the orange through yellow. Red and magenta is when you're getting really high signatures; correct.

Q. So the signature that we're seeing in the area around the blowout from a deeper frequency are about 150?

A. Yes. That's an anomaly, in my opinion, particularly with the green on the south side. That's an anomaly. That's consistent with what particularly the groundwater measurements, which the ground -- in my experience, the groundwater contamination, absent a lot of soil contamination, won't respond as much as salt-saturated soils because of the mass that the instrument is detecting. So that's pretty consistent with the data we've collected.

Q. Well, the GEM readings that you, ICON, took in this Area 2 around the blowout reflect readings from about 100 on the outer band of the blowout area to about 150. I mean, that's your GEM survey; is that right? And that's what the data reflects?

A. Actually, up to about 250. If you notice, there's a green, an area of green on the south?

Q. Right here?

A. Yes.

Q. Okay. So 200?

A. Between 200 and 250.
Q. I don't see yellow. I see green. Where do you see yellow? Or maybe you don't --
A. I don't see yellow. I see green.
Q. And that's 200?
A. It's 200 to 250. Anything that is within 200 and 250 will be plotted green.
Q. I don't see anything in that orange zone that you mentioned earlier --
A. That's correct.
Q. -- that purple zone, 500, 750 and above?
A. That's correct.
Q. That's around the blowout location; is that right?
A. That's correct.
Q. You visited this property once, as I mentioned earlier?
A. In conjunction with this case, yes.
Q. Have you visited it again since I last deposed you in November?
A. No.
Q. You didn't see any salt-scarring around this blowout area?
A. I did not.
Q. In fact, you didn't see any

salt-scarring anywhere at the property that you visited that one time; is that right?
A. Other than at a location east of this was a former pad area that had what appeared to be some stressed vegetation or salt-tolerant vegetation like baccharis.
Q. And you're aware of the fact that's not a pad associated with any Gulf operation; correct? Do you know that?
A. I do. But I'm answering your question.
Q. The pictures -- and let me just -- I want to make sure I understand this.
MR. GREGOIRE: Let's move to Greg No. 11, Jonah.
BY MR. GREGOIRE:
Q. This is -- this is not a picture of the site itself or at least any of your equipment at the Henning site; is that correct?
A. It's a picture of my equipment. I don't know what site it is.
Q. Okay. Let's move to Greg 22.
So you have -- in Greg 92, this is your cross-section A, A prime; is that right?
A. That's correct.
Q. And so here you identify a water well

driller's log, 6649-Z?
A. That's correct.
Q. And it appears as though that water well intersects what appears to be a shallow zone, shallow stringer, somewhere about the 32- to 35-foot depth; is that right?
A. That's correct.
Q. I'm going to show you this water well driller's log from the well P&A for that particular well.
We're going to pull it up on the Elmo. I'm going to refer you to page 2.
As you can see, I'm not technologically inclined -- advanced at times. There you go. All right. Here we go.
Okay. So this is the driller's log of that well 6649. And it's part of the plug and abandonment report; is that right?
A. That's correct.
Q. And so the log, it shows a lithology as being clay from zero to 128 feet; is that right?
A. That's correct.
Q. And from 128 feet to 180 feet, fine sand?
A. That's correct.

Q. It does not identify any type of silt or sandy areas within that zero to 128-foot zone; is that right?

A. That's correct. And that's not surprising.

Q. But this is the water well driller's log, and you're referring to a shallower water zone that this well penetrates; however, the water well driller's log doesn't identify that.

A. That's correct. That's because it's Lance Guichard's company. I'm familiar with those guys. That's a mud rotary drilling. And again, those holes are drilled with native -- probably not much bentonite, but maybe a little bit. They are only going -- not "they," but typically water well drillers only log major changes in lithology such that they would never even notice finer grains, silts, and sandy silts that would be coming up in the drilling mud because it's incorporated into the fluid, the cuttings of the clay and the water in the pan of the drilling rig or --

Q. Are you -- go ahead. Keep going. I'm sorry.

A. There's a USGS publication that was

published about six or seven years ago, and I mentioned it to you during my deposition where they were identifying these large water-bearing zones within the Chicot Aquifer confining unit. I forget the exact name of it, but it's pretty much the title is about something like that. And in there, they have a discussion about that they were relying on water wells driller's logs. And what they said is that the absence of a description of such shallower intervals does not mean they're not there but they attribute that to lack of consistency in logging the detail of the cuttings, whereas they say some driller's logs are very careful to log more carefully than other driller's logs. So the absence of a description doesn't mean that it's not there.

Q. So are you saying that Guichard compromised its water well drilling --

A. Not at all.

Q. -- in its depiction of the lithology? Is that what you're telling this panel?

A. Not at all. I'm saying Guichard is only logging the major changes in bulk matrix that are observed coming into a drilling pad.

Q. So what you depicted --

A. Actually, Mr. Gregoire, this is a much better done driller's log descriptions than many that I've seen that discuss things like gumbo, which is a description that's real common.

Q. So are you saying that your depiction of a shallower zone at that depth of about 30 to 35 feet is not a major change in lithology for the water well driller to identify?

A. It's a harder lithology for the water well driller to identify, given the nature of the drilling fluid. Again, they're not looking at core samples. They're logging cuttings that are coming up mixed with a bunch of clay cuttings and water.

Q. Let's move to the next slide, Greg 24.

And you identify -- actually, let's move back. I'm sorry. Let's move back.

MR. GREGOIRE: Let's go to Slide 23, Jonah.

BY MR. GREGOIRE:

Q. We'll take a look at No. 5420-Z.

Is that a well that you identify at that particular part of the property between H-28 and H-6?

A. Yes.

Q. I'm going to show you the water well

abandonment and plugging form along with the driller's log for that well.

A. Do you want me to hang onto this?

Q. I'll take it back from you.

Here you go.

So you identify, again, a stringer, shallow water about the 30-foot depth that this water well 5420-Z penetrates; is that right?

A. Yes.

Q. I want you to turn to page 3 of the plug and abandonment form for that water well, which has the driller's log description. And at 0100, it includes a description of shale; is that right?

A. Correct.

Q. And then 100 to 110, sandy shale; is that right?

A. That's correct.

Q. It does not, the driller's log does not identify a water-bearing formation at or around the 30-foot level, as you have depicted on your cross-section B to B?

A. That's correct.

Q. So this water well driller, for this particular well, did not identify a structure or lithology major enough to identify it as a water-bearing zone; is that right?

A. Correct. As a matter of fact, he calls the clay a shale, which is not technically correct either, so...

It's -- again, that's just variabilities in how the multiple drillers log their cuttings.

MR. GREGOIRE: I'm going to mark both of these exhibits; that is, the water well, the plug and abandonment report for 6649 and 5420-Z as Exhibits 154 and 155.

MR. CARMOUCHE: No objection.

JUDGE PERRAULT: No objection. So ordered. Exhibit 154 and 155 are admitted.

(REPORTER'S NOTE: DEFENSE LATER RENAMED THE EXHIBITS 158.1 AND 158.2)

MR. GREGOIRE: Jonah, let's move to SPEIADC article. It has "Barium, True Total Barium" paper at the top. It's not numbered.

BY MR. GREGOIRE:

Q. So you discussed this question earlier in connection with questions from Mr. Carmouche about sampling procedure for barium; is that right?

A. Yes.

Q. This article addresses the dry and grind method as it relates to the method for determining true total barium in comparison to the SW-846 protocol; is that right?

A. That's the subject matter of the article, yes.

Q. It doesn't discuss the propriety of whether to use dry and grind in connection with a method for comparison or sampling of barium as opposed to true total barium; is that right?

A. No, it does. What it does is it's discussing a historical perspective of how they were analyzing barium from '86 to '89, using SW-846 methods, using the dry weight method, which is the dry and grind. And as you'll see, if you can move the article a little bit further up, and the second paragraph below the abstract is talking about "Three published revisions have been made since the EPA concerning test methods for evaluating solid wastes." And the differences had to do with revised protocols, which is what is -- he is describing further in the highlighted section I've written down -- or highlighted at the bottom-right. And that latest revision, SW-846 in that second paragraph refers to the 1986 revision.

So what he's describing is that from

1986 to 1989, they were doing a drying and grinding operation to obtain a more representative sample. So he's laying the foundation of what they were doing at the time that they were observing these discrepancies in the barium concentrations when they were closing on-site pits.

Q. But this was particularly for true total barium. If you read the next paragraph, does it not read that "Experiments were designed and conducted to provide a method for determining true total barium for comparison to SWA-46 protocol"?

A. That's the whole purpose of the paper. So the paper was to address the discrepancies found by the protocol that was discussed on this first page.

Q. So is it your opinion that this article stands for the proposition that dry and grind should be used for -- in connection with barium samples and analysis of barium samples as opposed to true total barium?

A. Well, it's my personal -- it's my personal opinion as a scientist that the dry weight is the appropriate protocol to use for all metals and solids, and the dry weight prep method involves drying and grinding. As for what is most representative, I'm going to leave that up to the panel for all of the references that have been discussed. They've heard a lot about barium this week. I'm of the opinion that we are under-measuring the total bulk barium in the subsurface by both methods by eliminating the nodules as per the method, and the nodules are reportedly to contain much higher concentrations of barium and iron and manganese.

Q. Let's go to where we can agree. You used the dry and grind method for true total barium. Did you do true total barium sampling in this case at all?

A. We did.

Q. You did? You used the dry and grind procedure; is that right?

A. We used the dry weight for SW-846 methodology. And true total barium also has a dry prep method with it, but the extraction procedure's a lot more involved to get more of the total barium content out of the sample, which goes with the higher regulatory limit associated with true total barium.

Q. You do not dispute that ERM also used the dry and grind method in connection with its sampling for true total barium?

A. No. That's what the method requires.

Q. And that's what -- that's what occurs; is it correct? Or do you know? Because you didn't include the ERM sampling in your plan. So do you know that?

A. Oh, we looked at ERM's sampling. But all the true total barium is done on a dry-weight basis and that includes reporting as well as prep. What they did not do is do a dry and grind prep method for their SW-846 method of metals. They did it on a wet weight, which is extracted from wet material, which the prep method says can be really hard to obtain a representative sample.

Q. There are no exceedances for true total barium in the soil at this property; is that right?

A. I really did not focus on soil. Groundwater was my area. It would be a better question for Mr. Sills.

Q. I didn't know you put up a -- you testified about a slide earlier about the 18-foot area where you, ICON, proposed to excavate?

A. That had to do with the SPL -- the 29-B leachate chloride exceedance, the leaching exceedance. That was the blue box.

Q. We'll get to that.

Why did you include --

MR. GREGOIRE: Let's go to the last slide in that deck -- or second-to-last slide, Jonah. Second-to-last slide. It's predicting attenuation of a salinized surface. Put this on the Elmo.

BY MR. GREGOIRE:

Q. This was in the presentation you provided us yesterday.

This is an article that is entitled, "Predicting Attenuation of Salinized Surface in Groundwater Resources."

MR. CARMOUCHE: I don't mind him answering, but I'm going to object and ask that the panel be instructed because I don't want them to be confused. I had given Mr. Gregoire a slide show yesterday before Mr. Angle finished. And then this morning, I came and I took out slides that we weren't using because they weren't relevant, and I told him that. So with that objection that he's showing slides that I already told him were not relevant to Mr. -- he can question him on it. But I want the panel to understand that I didn't intentionally show this. I took it out the slide show.

MR. GREGOIRE: I thought you meant the one before.

BY MR. GREGOIRE:

Q. Are you not relying upon this article in this case, are you or aren't you?

A. I haven't rendered opinions on natural attenuation in this case. I prepared this with the understanding that Mr. Angle was proposing to do natural attenuation for chloride and benzene. So this was to support my comments to what I understood he was going to present.

JUDGE PERRAULT: So is there an objection?

MR. CARMOUCHE: There's an objection as to that it's not relevant because Mr. Angle didn't testify what we thought he was going to testify to, so I didn't show it to him. But he can ask.

MR. GREGOIRE: We'll move on.

JUDGE PERRAULT: If there's no objection.

BY MR. GREGOIRE:

Q. So Mr. Miller, you never included any of

ERM's soil and groundwater sampling data in your plan, in the ICON plan; is that right?

A. Yes. We didn't -- that's correct. What we presented were the results of our splits of their sampling. So that's what we -- that's what's in our plan.

Q. But did you not include ERM's actual samples of the soil and groundwater except for your splits --

A. That's correct.

Q. -- at the same location?

A. That's correct.

Q. Do you know that ERM included ICON's sampling data in its plan?

A. Yes.

Q. And evaluated it?

A. Yes.

Q. So why didn't you include ERM's data in your plan?

A. Because ERM typically presents both sets of data and I just didn't want to repeat that work. That could be found in their table.

Q. Don't you think it would be helpful for the panel to obtain your, ICON's analysis, of both data sets and not ERM's analysis of both data sets?

A. Yes. And they had that in our tables. They had all of the results of our data from the split samples that we collected.

Q. So you defer to ERM's evaluation of both data sets, your data set and their data set, since it's the only analysis that sits before this panel?

A. I'm not sure I understand what you're saying, but it's as simple as this.

We -- in our report is a summary of the results of our samples submitted to the laboratory, of our sample locations and the split samples that we collected while ERM was doing their sampling. If you wanted to see a table to compare their data with ours, I would refer you to the ERM tables that include all of that data. But I didn't want to be duplicative in making a voluminous table that they could refer to in ERM's because ERM does that as a matter of practice.

Q. You didn't data-validate your samples; that is, ICON's samples; correct?

A. We didn't go through a formal validation, but we always evaluate a laboratory QA/QC. That is on the back of the laboratory reports. So they discuss the laboratory control, the LCS, the matrix spike, matrix spike duplicate. So we look at all of that to make sure that everything meets a method protocol. And importantly, we also compare our results to ERM's results. We just didn't compile all of that to another table. We also compare for groundwater. We always look at the relationship between TDS, chlorides and field-measured specific conductivity. So those are all routine checks we perform on every project.

Q. So your answer is no, you did not have your samples, ICON's samples, validated by another entity other than the entity that you sent the samples to?

A. We -- well, there's -- we didn't have a third-party validator come and do a validation report. We did rely on the laboratory reporting of their QA/QC, but the review of all that was done with ICON personnel but not in the format of a formal report. What we do with all of our work is to make sure that the data that we're getting is checking all the boxes on -- that the results look accurate and representative.

Q. Let's talk about your 29-B plan, ICON's plan.

It's based on a remediation of soil to depth of up to 32 feet; is that right?

A. All I know is that -- that's a Jason question because, again, as you're aware, I didn't do any of the soil evaluation. I'm aware of the general areas that he is addressing. And I'm aware of where we had the leaching exceedances. But I can't answer specifics about anything about the soil.

Q. ICON has not implemented a soil remediation at an oil field site at a depth of 30 or more feet? Isn't that correct?

A. Other than the closure of the reliable facility, which resulted in a -- in about a 25-foot-deep pond, which is now an excellent bass pond. But we left the excavation open to be flooded as a stormwater management pond, so yeah, that was about a 25-foot-deep excavation.

Q. As far as the excavation of soil up to 32 feet for any property subject to the Office of Conservation's jurisdiction within these Act 312 cases, you've never -- you, ICON, have never performed that type of remediation; is that correct?

A. That's correct. That's correct.

Q. Your exception plan, as we understand it, includes remediation of soil up to a depth of 12 feet and up to 18 feet where your chloride leachate value exceeds a certain number; is that correct?

A. I can answer on the leachate chloride, for certain, is to a depth of 18 feet.

Q. That 18-foot depth excavation would occur, at least you propose that it occur at H-16; is that right?

A. That's correct.

Q. And it's part of what you -- this is a part of what you testified about earlier; correct? The one location where --

A. The blue box.

Q. Is that the one location where ICON proposes to excavate the soil under its exception plan? I thought that's what I heard you say earlier.

A. That's the one location where we are addressing leaching soils to a depth of 18 feet.

Q. So that's an area where ICON proposes to excavate the soil to a depth of 18 feet, it's going to be a trench, it would be a trench; is that right?

A. I don't know the details. I just -- what this is, is my familiarity with the general locations and size of the areas where the proposed soil remediation is, but I didn't work on any of the aspects of the soil for the plan.

Q. ICON has never worked on a project where it remediated soil up to a depth of 20 feet and used it as a trench to flush the underlying soils, which is what it proposes to do at this property; is that right?

A. Actually, I've done that at the Tensas Parish Police Jury tank farm, had a huge release, and I personally excavated probably a 15-foot-deep excavation that was left open for probably eight or nine months to flood and facilitate flushing of the subsurface. So yeah, I've done that for petroleum hydrocarbons.

Q. Do you know whether ICON's even performed an analysis of this flushing project that it proposes to implement in this 18-foot trench?

A. At this site?

Q. Yeah, at this site.

A. No.

Q. Hadn't done that; right? Not that you know of?
A. We haven't done a specific modeling of like -- or predicting to quantify the effects of leaching on this particular project.
Q. So ICON has not prepared any type of evaluation to determine the amount of water that it proposes to flush from without that -- that 18-foot trench; is that right?
A. We have not performed a model to predict a leaching rate of flushing water, if that's what you're asking.
Q. ICON hasn't performed any type of evaluation or analysis to determine the length of time that it proposes to flush the underlying soils from that 18-foot trench; is that right?
A. We are removing leaching soils. The flushing is to aid in recharge to the aquifer during a groundwater remediation. So we're not relying on flushing to address soil contamination. We're removing the soil contamination.
Q. Okay. Well, let's ask that question, then. ICON hasn't performed any analysis to determine the time by which it proposes to flush the underlying soils to clean or remediate the

shallow groundwater?
A. Correct. Any flushing would be additional infiltration to the aquifer. We did not quantify that amount.
Q. So you, ICON, submitted a proposed most feasible plan to this panel, to the Office of Conservation to dig an 18-foot trench to flush the underlying soils in an effort to remediate the groundwater, yet you've provided no analysis to support, support that method of remediation?
A. No. We're proposing an 18-foot-deep trench not for the purpose of flushing. We're proposing an 18-foot-deep for the purpose of removing soils that exceed the leaching standard. What we're proposing to do is to leave the trench open to -- and flooded to assist with additional flushing of residual impacts and to aid in recharge of the shallow aquifer during remediation. So it's not quantified, but it's done as a practice to aid with those objectives.
Q. Where can this panel find your analysis of that flushing system that you've proposed to incorporate as a part of that trench? Where are your plans?
A. The description would be included in the

soil section, but as I said earlier, we didn't do any kind of modeling to quantify it, nor is it needed. It's not like we're relying on the flushing to accomplish anything. Just the fact that we're doing it is going to aid in contaminant recovery.

Q. Well, Mr. Carmouche showed you Chapter 6 of 29-B and the requirements for proposed feasible plans?

A. Yes.

Q. To support evaluation and remediation?

A. That's correct.

Q. You didn't include your analysis to support your remediation of that particular trench and the flushing associated with it?

A. And nor do we have to because it's not the primary mechanism or purpose of the trench. The purpose of the trench is to physically remove leaching soils.

Q. You excluded RECAP as a remedial goal for both soil and groundwater in your plan; is that right?

A. I can speak to groundwater. So groundwater, yes, I excluded RECAP.

Q. Soil, you didn't include any analysis of

RECAP, at least I didn't see any tables in your data charts that compared the soil sampling data to RECAP; is that correct?

A. I personally didn't do the soil evaluation. So the way we split up tasks in this project is I handled -- everything that I discussed, I presented earlier this morning, and up to the polygons and the design of the groundwater recovery model. I didn't have anything to -- and looked at where the 29-B leaching soils existed in the subsurface. I didn't have any other aspects of the soil evaluation.

Q. You produced two other reports in this case, in the litigation itself?

A. That's correct.

Q. So one of those reports actually included RECAP as a remedial goal for soil for certain constituents like TPH and barium? Do you remember that?

A. Same answer, Victor. I didn't do anything to do with the soils in those reports either.

Q. You don't dispute the fact that ICON included a remediation goal to MO-1 both for TPH and barium in one of its litigation reports in this case?

A. We may have, but again, I'd have nothing to do with soil. I couldn't tell you how it was -- how he did his delineation. I was just uninvolved with those aspects of the soil evaluation.

Q. Why did your colleagues exclude RECAP in its evaluation of the soil for this panel to review your analysis as you did in your litigation report?

A. I would really direct you to Mr. Sills to discuss anything to do with the soil. That's really -- I did not participate in that aspect of the plan.

Q. You do not dispute that LDNR's Office of Conservation has applied RECAP to its analysis of the soil and groundwater in these types of cases that are bound by Act 312 in prior litigation, in prior panels?

A. I can't predict what they're going to do in this case. I mean, because 29-B is an appropriate, relevant standard to apply in these types of cases.

Q. You've been involved in a lot of these cases, particularly two of them, and we're going to talk about those later.

A. Yes.

Q. Act 312 hearings. You were involved in Poppadoc; right?

A. Yes.

Q. And you were involved in East White Lake; is that right?

A. That's correct.

Q. And both the panels, did the panels apply RECAP?

A. To the soils?

Q. Soil, yes.

A. I just don't recall.

Q. What about groundwater?

A. Groundwater for VPSB is going to rely on a background standard that has -- the whole background program has yet to be approved. So that's pending, I guess, right now.

Q. We've talked about this before in your deposition. You're aware of Mr. Adams' memo from the Office of Conservation on applying exceptions to 29-B, including RECAP; right?

A. Yes.

Q. And did not Mr. Adams conclude that

after and when you go through an Act 312 contested agency hearing, that the agency would apply, would apply as an exception to 29-B RECAP?
A. If I recall, Mr. Adams said that landowner concurrence is not needed for an exception to 29-B if there's a public hearing that is held. That's what I recall.
Q. And what are we at right now?
A. We're at a public hearing.
Q. You know Dr. Richard Schuhmann; right?
A. Yes.
Q. He produced comments to ERM's proposed plan; is that right?
A. I think he did in a framework of the RECAP evaluation.
Q. Dr. Schuhmann's report calls for the application of RECAP, at least his analysis of RECAP, to the soil and groundwater? Do you know that?
A. I do not. I briefly looked at his report but didn't review it.
Q. So you didn't rely upon Mr. Schuhmann in arriving at any of your soil and groundwater remediation costs and analysis that are a part of your proposed feasible plan --

A. I would say that's correct.
Q. So when Mr. Schuhmann gets up on the stand tomorrow, this panel can be assured of the fact that you didn't rely upon any of his analysis of RECAP in arriving at your opinions about remedial goals for the soil and groundwater at this property?
A. I would say that's correct. The only thing I recall working with Dr. Schuhmann on had to do, again, with the leaching criteria. Because RECAP has a method in one of the appendices to do a site-specific -- remember, I said the Summers model had a default dilution factor of 20. RECAP provides a method to use site-specific data to do a site-specific dilution factor, which I did and Dr. Schuhmann reviewed and I think Dr. Schuhmann did it independently. That's the only thing I recall working with him specific to this project.
Q. Dr. Schuhmann didn't ask for you to provide him with -- for you, ICON, to provide him with any soil and groundwater remediation estimates in connection with his RECAP analysis of the soil and groundwater at this property; is that right?
A. I don't recall that, no.

Q. So when Mr. Schuhmann gets up here tomorrow, where you're sitting, and testifies about his analysis in this case, this panel can be assured of the fact that he didn't rely upon ICON in arriving at any costs for his proposed soil and groundwater plume and remediation of this property?

A. I have no idea.

Q. He didn't --

A. I can tell you, I didn't rely upon his RECAP comments for our work.

Q. Well, did Dr. S- --

A. The other way around, I have no idea.

Q. Did Dr. Schuhmann come to you or any of your colleagues and say: Hey, this is my RECAP analysis. I would like for you to run costs for remediation of the soil and groundwater as per my analysis?

MR. CARMOUCHE: I'm going to object, Judge. This entire time, he's asking about other experts. He knows Mr. Schuhmann filed a comment to their plan, so all of Mr. Schuhmann's work was to comment as to their RECAP evaluation. So I'm going to object as to relevance in crossing Mr. Miller about what Mr. Schuhmann did, when he's going to testify. It's irrelevant.

JUDGE PERRAULT: What's the relevance of this?

MR. GREGOIRE: The relevance is that -- and you'll hear it tomorrow from Schuhmann. He proposed remediation of 37, yes, 37 acres of soil in this case. And my question is, is did he approach ICON, the landowner's remediation expert, about running those costs? I think that's very relevant.

JUDGE PERRAULT: How is that relevant?

MR. GREGOIRE: If he has no costs associated with his remedial goal, then his plan is -- it can't be of -- I guess it can be evaluated by the panel, but part of what's required in Chapter 6 is if you propose any remediation, you have to have costs associated with it.

JUDGE PERRAULT: And Schuhmann's plan has no costs?

MR. GREGOIRE: No.

MR. CARMOUCHE: First, Mr. Schuhmann commented on their plan. Mr. Miller has testified 15 times that Mr. Sills did the soil evaluation. So again, it's not relevant. If he wants to ask Mr. Sills if he did an evaluation of the soil that Mr. Schuhmann does, okay, but it's irrelevant to this witness.

MR. GREGOIRE: If he says he doesn't know, he doesn't know, Judge. But I'm entitled to ask the question. I think it would assist the panel, and if he doesn't know, he doesn't know.

JUDGE PERRAULT: You're asking him if he knows about the cost?

MR. GREGOIRE: No. Whether Dr. Schuhmann has asked ICON, approached ICON to develop costs for his remedial goal under his RECAP analysis for soil and groundwater.

JUDGE PERRAULT: I'll allow it. Let's see.

BY MR. GREGOIRE:

Q. Do you want me to reask the question?

A. No. You hadn't asked me. ICON's more than me, so...

Q. So the question is -- I did ask you and I think it's with all the going back and forth, you forgot.

Did Dr. Schuhmann approach anyone at ICON, including you, about running costs for his

RECAP analysis of the soil and groundwater?
A. I can only speak to me. I mean, he didn't ask me about it. I don't know what he did to anyone else at ICON. I just don't know.
Q. Is your plan with exception based upon any rule, regulation or standard that you seek to apply instead of 29-B?
A. Again, I think that's referring to a soil issue, because I think -- and as I -- I think the exceptions that Jason Sills is assuming is -- is essentially restricting the depth of investigation. So I don't -- certainly not in my standpoint are we taking an exception to apply -- to apply any other regulations, rules in place of the 29-B standard, if that's what you're asking.
Q. Let's talk a little bit about your testimony about the blowout and your analysis of the lithology and data in that area. Is it fair to say that you've relied upon data from wells and borings that are adjacent to or near the blowout well for your opinion that there are impacts that exist in the soil and groundwater resulting from the blowout?
A. Yes.
Q. Okay. And we can agree that those

impacts are primarily related to salt-based impacts; is that right?

A. Salt, barium, benzene, radium.

Q. Salt is the driver for your remedial goal, is it not?

A. I didn't do the pore volume estimates, but given the high concentrations of chlorides, I would assume chlorides were the driver in the vicinity of the sinkhole and that, once you flush the chlorides out, you will have addressed all of the other constituents that co-occur at that location.

Q. I'm going to move to your cross-section. It's probably easier to refer to your slide presentation as opposed to the actual exhibits.

MR. GREGOIRE: So Jonah, can you pull up Greg 22 of Mr. Miller's slide presentation?

BY MR. GREGOIRE:

Q. Okay. So Mr. Miller, you have depicted, on this cross-section, A to A prime, the lithology from MW-3, I guess, to H-20; is that right?

A. Yes.

Q. Okay. So we can agree that H-12 and H-11 are the closest monitoring wells to this pond; right? The pond where the blowout occurred?

H-12 and H-11?
A. I mean, it's the blowout crater.
Q. Now, is this supposed to be your pond, this oblong figure that extends out to about 20 feet?
A. It's a depiction of the surface of the crater.
Q. And you're aware of the fact that that pond is 15 feet, not 20 feet; is that right?
A. Well, they TDed, yes, but it's -- yes, I'm aware of that.
Q. You're aware that ERM, they took a depth survey of that pond and it's 15 feet?
A. Yes.
Q. You didn't perform an independent analysis to determine the depth of that pond?
A. Correct. I mean, it's a crater that probably had a much greater depth at the time of the blowout and, as all craters do, they silt in with time. So it's -- I don't dispute that they tagged the base of the water at a depth of 15 feet. I don't dispute that.
Q. This area "possible disturbed zone around blowout," you see that extends from the bottom of the pond, which you represent to be

20 feet --
A. Yes.
Q. -- we know it was 15 feet?
A. That's correct.
Q. Down to approximately 145 feet. That's an area that you yourself drew; is that right?
A. That's correct.
Q. This area is not based upon any data, no data that you have in your possession to support the existence of this quote/unquote possible disturbed zone around blowout; is that right?
A. No geologic data; correct. As I testified earlier, that is a depiction of the possible disturbed zone with the knowledge that the well blew out to the ground surface for an extended period of time, thus having to -- and it came on the outside of the surface casing, which requires that it travel through that vicinity of the disturbed zone.
Q. Again --
A. That's why it's depicted on the cross-section as possible disturbed zone.
Q. I want to make sure we're clear on the record. You have no data, no evidence to support your oblong possible disturbed zone blowout area,

which starts at approximately 20 feet and extends down to the Chicot at about 145 feet on your cross-section?

A. None other than the narrative description of the blowout event.

Q. And while we're on the blowout event and what, at least in your opinion, the cause was, on page 6 of your -- of ICON's plan, you conclude that the well blew out at the wellhead connection; is that right?

A. Yes.

Q. Where is the wellhead connection, do you know?

A. It's -- I think they lost it. I think the wellhead was lost in the blowout.

Q. Where is the wellhead connection? Do you know where it exists in connection with the well itself?

A. On a typical well?

Q. Yes.

A. Yeah. It's where the Braden head flange is welded onto the casing, and then the well head gets screwed into the Braden head flange with an O-ring, so... that's the wellhead connection.

And I think it was starting to -- and

again, you've got the full description of it, but I think they were seeing sand starting to cut through those connections. First thing they tried to do was tighten up the nuts on the wellhead, but they were already tight. So I think they knew they were in trouble at that point.
Q. You don't dispute the sampling results or at least the results of the sampling that ERM conducted of that pond at the blowout location?
A. Of the water sampling?
Q. Yeah, the surface water sampling of the pond.
A. No.
Q. You know that ERM took samples at two different depths?
A. I do, yes.
Q. You do not dispute that that surface water sampling does not reflect any type of regulatory exceedances in that surface water?
A. No. The surface water of the crater was clean of the chemicals that they were analyzing for. I mean, other than things that were detected which you would expect at those concentrations.
Q. It's a freshwater pond; right?
A. It's a flooded crater that -- that's

correct.

Q. So --

A. I think -- but I think -- I would have to check the report. I think our split of -- I think the deep groundwater sample might have had a hit of TPH diesel, petroleum hydrocarbons. I would have to look at that.

Q. You didn't fractionate it; right?

A. No. But it was a mixture hit.

Q. Do you know if RECAP, in the presence of fractions and TPH bulk, which the agency prefers? It prefers fractions, doesn't it?

A. For risk evaluation, but for assessment purposes, the mixture provides more data than the fractions. You can't get any information other than a relative exceedances or not of a fraction. You can't get things such as the shape of a chromatograph to see what potential product you might be dealing with.

Q. So is it your testimony, Mr. Miller, that, for purposes of assessment, TPH mixtures is more probative than fractionation?

A. Provides much more data, yes. You could find that in the TCEQ guidance documents for performing, you know, assessments of petroleum

hydrocarbons.
Q. I'm sorry, what is TCEQ?
A. The Texas state regulatory agency.
Q. We're in Louisiana; right?
A. I don't care. I'm talking about science.
Q. Do you know what RECAP provides?
A. So the RECAP provides the ability to run a mixture, but they prefer, when it comes to calculating risk comparative standards, to use a fractionated method. I'm still going to sit here as a scientist and say that the mixture provides more information for assessment purposes and that is addressed specifically at the TCEQ.
Q. So let's go to your borings next to each of the wells. Let's first start with H-12.
MR. GREGOIRE: And Jonah, if you would go to Greg 12, please. Move to that slide.
BY MR. GREGOIRE:
Q. So if we look at the conductivity log, it shows a peak at somewhere between 55 and 60 feet; is that right? Sixty-five, 63 feet?
A. Yeah, probably at about 58, I would say, is probably where the highest readings would have been recorded.

Q. And then, when we reach at a depth of approximately 80 feet, we've got steadily declining conditions to at least 100 millisiemen per meter; right?

A. Yes. It appears -- the log is actually responding in what I would call "baseline conditions," kind of nonimpacted, probably starting at this depth right here (indicating), at 76, where you've got little clay lenses and these are probably silts right here. So this is -- the base of impact would come down about right here (indicating).

Q. But what we're seeing, we can agree that when you -- you proceed at depths deeper than approximately 55 to 63 feet, you start to see declining conditions down to 80, where you're about 100 or so; is that right?

A. That's correct.

Q. Have you reviewed ERM's boring log at the location adjacent to H-12?

A. Yes. I looked at theirs as well as our -- my field guy's descriptions in the log book, their descriptions.

Q. Your boring is about 54, 55 feet? Is that where it is?

A. The coring is. The well was installed to a depth of 60 feet and then, of course, conductivity probe went down to about 82.

Q. Okay. Do you know how deep ERM's well was, the depth of its boring?

A. I think maybe 76, something like that.

Q. Do you know what the lithology is at the depths of 62 to 78 feet in the ERM boring?

A. I recall predominantly clay.

Q. We already talked about some of the water well driller's logs that you at least depict on your cross-section. Have you reviewed any of the water well driller's logs for the adjoining properties?

A. I'm sure that I have.

Q. Do you know if any of those logs identify a shallow aquifer?

A. I don't recall. I just don't recall.

Q. Certainly, one thing that both your cross-section and all of the water well driller's logs show is a thick confining unit that separates at least the shallow water in the Henning property and the Chicot; is that right?

A. Yes. That's why -- and I don't dispute that because our -- again, the shallow aquifer on the Henning property has a static head. It's within 5 feet below ground surface. Chicot comes in around 45, 50, somewhere in that range.

Q. So your cross --

A. There's enough of a confining effect to -- to allow that difference in head to develop.

Q. So you would agree that your cross-sections reflect that the depth of the Chicot range is from 110 feet to about 140 feet?

A. I would agree with that.

MR. GREGOIRE: Let's go to H-11, Jonah, which is going to be -- I'm going to have to look at the exhibit.

Let's look at Exhibit E at page 73, Jonah.

BY MR. GREGOIRE:

Q. You can look at it on here, too, Mr. Miller. You have it on the screen.

This is the other boring near the blowout location. You have H-12 on one side, H-11 on the other; is that right?

A. Yes.

Q. Okay. So EC or conductivity itself is pretty consistent, you don't see any real spikes; is that right, except for maybe about 40 feet at

about 400?
A. That's correct.
Q. And then we have declining conditions. As we reach 65 feet, we're at somewhere around maybe 200; is that right?
A. I would characterize it as a very low level but broad, slightly elevated signature, starting at 31 -- well, can you unzoom it for me, please? There you go.
From about 31 down to probably 57, something like that. It's certainly low magnitude -- field measured -- I mean lab-measured EC is 6 1/2. Probably on either side of the spike, it's probably closer to 4 1/2, but that's how I characterize that response.
Q. And that's on the opposite side of the blowout location; is that right?
A. That's correct.
Q. So we've reviewed the lithology through the boring zone in H-12 and H-11. Those are the closest to the blowout location; is that right?
A. And there's another that I'll have to look in plain view on the maps, but there were three around the crater.
Q. Do you have your slide deck?

A. No.
They did a pretty poor job of reproducing some of this (indicating).
H-9, H-12 and H-11 were the three around the sinkhole.
Q. The sinkhole -- okay, you're talking about the blowout area?
A. The blowout area.
Q. Certainly, the closest borings to the blowout location were H-11 and H-12, and your cross-sections reflect that; is that right?
A. I'm not trying to be evasive, but I'd have to really -- I think all three of those borings were equally close. It's just my cross-section just incorporated those two because of the way the cross-section was drawn.
Q. And if we look at Greg 22 --
MR. GREGOIRE: Let's put that up again, Jonah.
BY MR. GREGOIRE:
Q. If we look at Greg 22 -- and this is your cross-section; right?
A. Yes.
Q. You identify H-12 and H-11 as the borings closest to that pond in the blowout area;

right?

A. All I'm saying is that's the way it was drawn. If you look down here at the -- down here, it's a transect, H-9 is also probably as close to the crater. It's just off in a cross-section.

Q. You haven't communicated with Dr. Schuhmann about whether, in his opinion, hydraulic communication exists between the shallow water-bearing zone at the blowout location and the Chicot Aquifer?

A. You're asking if I discussed it with him?

Q. Yes.

A. I really don't recall. I mean, I may have. I don't know.

Q. And as you testified earlier, you don't have an opinion on whether the level of constituents in the shallow aquifer at any location on this property threatened the Chicot Aquifer; is that right?

A. I think that's correct. And again, I've got, in reservation, that H-10 head anomaly is troubling because that could indicate a potential downward vertical migration pathway. It's -- it's anomalous, given the data that we have out there.

Q. You did --

A. So -- to the degree that contamination might be transported by a potential pathway downward vertical gradient in the vicinity of H-10, that would be the only potential that I recognize currently. And the only evidence I have is this head anomaly.

Q. You didn't identify any gravel channel deposits in any of the borings at this property; is that correct?

A. That's correct. This channel deposit wasn't of that magnitude of discharge velocity to carry that type of material.

Q. Did I hear you correctly -- and you testified about this in your deposition, that you -- you call into question your background locations?

A. I don't call into question the locations. I call into question the -- how representative the data from those wells is of a true background location on the property.

Q. And I think you questioned in your deposition about how representative the background locations were because of what you thought might have been a pit in the area and a flow line header, a series of flow line headers. Do you remember that?

A. I do, yes. Yeah, that was another strange feature that popped up on a review of historical aerial photographs, was a pit feature to the east. But that, again, combined with the fact that those background wells are in the low area in the east where the entire property drains, and, as I testified in my deposition, that we are well within the fallout range of the blowout are all complicating factors to the data we're seeing from those wells.

Q. You could not or you have not identified -- and I know you couldn't in your deposition and you haven't identified today -- any oil and gas operation, let alone a pit or piece of oil field equipment, that was formerly located nearby your background locations; is that right?

A. Correct. There appeared to be, again, on a historical image, a pit feature to the east, and there appeared to be what appeared to be flow lines, but not in the vicinity of the wells themselves. There was a production facility to the west.

Q. And do you remember testifying in your deposition when I took it a couple of months ago that, in your opinion, the impacts from the blowout were centralized in that blowout location as evidenced by the data set?

A. No, I don't remember that.

Q. You don't remember that?

A. No. I remember discussing -- and I went to the Watkins description of the fallout within a 3- to 4-mile radius and that the background wells were within that radius. That's what I recall.

Q. You've proposed the installation of additional background wells as a part of your plan; is that right?

A. That's correct.

Q. And you don't know the location, at least you didn't in your plan and when I deposed you two months ago, where you would propose -- or want to place those background locations?

A. That's correct. I still don't know.

Q. You haven't performed any analysis of the data at this property to determine whether iron sulfate or manganese and/or manganese were naturally occurring or whether they correlate to any oil field constituent?

A. Not -- I did not perform a formal

correlation. I think I likely looked at iron, manganese and sulfate concentrations in general. But I didn't make a formal correlation map or a cross plot or anything of the sort.

Q. You do agree that the use of Bayou Lacassine as irrigation water or flooding waters could have an impact on the groundwater concentrations in the shallow water-bearing zone?

A. Sure.

Q. And while we're on the shallow groundwater, you do agree as well that you don't know of anyone who has used the shallow groundwater at this Henning site for domestic purposes?

A. That's correct.

Q. You don't know of anyone who has used any shallow water that might exist within a mile of this property for shallow -- for domestic purposes?

A. That's correct. There's a well -- and again, I did an assessment about 6 miles east where I saw another buried channel feature, and there's a water supply well installed in that feature to a depth of about 70 feet.

Q. How far away?

A. About 6 miles.
Q. 6 miles?
A. So it's another similar buried channel feature within the Chicot confining unit.
Q. You do agree that RECAP calls for investigation of any and all water wells that exist within a mile radius of the area of the AOI?
A. Yes, I'm aware of that.
Q. Are you aware of the fact that there's a 200-foot water well at the Henning property?
A. Yes.
Q. You are? Have you evaluated whether that well can be retrofitted and be used for domestic purposes?
A. I have not.
Q. Why?
A. I only recently discovered the existence of that well.
Q. When did you discover that?
A. Within the last few months.
Q. You would agree that the shallow groundwater -- and I think you referred to it as the A and B beds -- are not USDWs, underground sources of drinking water?
A. I would agree with that, yes.

Q. You didn't always refer to that shallow system as an A and B bed; correct?
A. I still call it a shallow aquifer. Shallow aquifer includes an A bed and a B bed and silty clays that transmit water adjacent to those two beds. But I still refer to it as a shallow aquifer.
Q. You produced two reports in the litigation before ICON produced its most feasible plan or proposed plan in this case; is that right?
A. We did an expert report and a rebuttal report, I think.
Q. Good memory.
In neither report, did you refer to an A and B bed in the shallow zone?
A. That's correct. That was done for the feasible plan.
Q. Your opinion, as it exists and it's always existed, that the shallow water-bearing zone acts as one unit?
A. It is.
Q. And for that purpose, you didn't separate it into different zones in your litigation reports?
A. That's correct.

Q. Do you know whether Dr. Schuhmann agrees with your characterization that the A and B beds act as one unit?

A. I don't know.

Q. A water-bearing zone was not penetrated with all ICON and ERM borings that extended through the depths of the A and B beds at this site; is that right?

A. Throughout the entire depth of the borings?

Q. Yes.

A. I don't know. I'd have to go and evaluate all of the borings and the depths of what was encountered. I don't know the answer to that.

Q. Are there not locations on this property where the A bed is not present?

A. There is.

Q. And are there not locations on this property where the B bed is not present?

A. That is correct.

Q. In fact, your assessment calls for the installation of additional wells where your wells did not penetrate the B bed; is that right?

A. There are areas where no borings penetrated the depth of the B bed, that's correct.

Q. Including yours?
A. Correct.
Q. That includes Well Nos. H-2; right? Let's put up Exhibit E, page 16.
A. There's no way I can work from memory.
Q. Let's look at this where it says "Additional Assessments" up here on the board for you, Mr. Miller. "ICON is proposing to install B bed wells at previous locations in Area 4: H-2, H-10, H-16, H-22, M-6 and MW-7?
A. That's correct.
Q. So you didn't encounter the B bed at or near those locations?
A. We didn't advance the borings deep enough.
Q. Did you review all of the ERM borings at each location --
A. I think that --
Q. -- at this property?
A. I think that I did, yes.
Q. So let's talk a little bit about your slug tests.
And as you testified earlier -- and I think Mr. Carmouche showed a chart -- where you averaged your slug tests separately, did you not?

For each bed, by bed?
A. That's correct.
Q. When you analyzed your slug tests in your litigation reports, your prior two reports, you didn't average your slug test results separately; right?
A. Correct. Nor did I separate the A and the B bed geologically from the shallow aquifer. It was done, again, to address the most feasible extraction of contaminants in the aquifer to prevent tailing effects. So it's a -- it's not only appropriate but necessary to independently evaluate hydraulic transmissivity of the A bed and the B bed to accomplish that.
Q. So is it your opinion that your groundwater remediation or your proposed groundwater remediation in your litigation reports is not feasible?
A. No. It's feasible. It's just a less -- it's less feasible than what we are presenting here in the feasible plan because this one involved a lot more evaluation and design.
Q. How many monitoring wells did you include in your proposed groundwater remediation in the litigation reports?

A. How many monitoring wells?
Q. Yeah, how many?
A. I don't know. Jason did the monitoring wells. We had a deep one and then I think we had maybe six or seven locations where we didn't penetrate the B bed. So we would have proposed additional six or seven locations there, so... eight locations, something like that.
Q. Do you know that you proposed 36 and 37 wells respectively, recovery wells, not monitoring wells. I'm sorry, recovery wells.
A. Okay. That's different.
Q. Let's talk the same lingo.
Do you know how many you included in your litigation reports?
A. I understood that the pore volume flushing resulted in about 400 wells per 85-acre plot.
Q. In your litigation reports?
A. No. In the feasible plan.
Q. In the feasible plan, you have 471 recovery wells; is that right?
A. I don't know, because, again, Jason would have put together that, but that demonstrates the changes due to additional

evaluation in what I believe to be the most feasible method to extract groundwater out here. So the extra work resulted in those changes.

Q. Do you know how many recovery wells you proposed in your litigation reports?

A. I don't.

Q. Thirty-six and 37, respectively, recovery wells? Do you know that?

A. I did not, no.

Q. Did Dr. Schuhmann perform a separate slug test analysis than your -- that is, ICON's -- slug tests?

A. I don't know.

Q. So you haven't seen, one way or the other, whether he did it?

A. No.

Q. You wouldn't know that, if Dr. Schuhmann performed slug tests for this property, whether his tests match yours?

A. I don't. I don't know. I don't even know that we gave him the raw data.

Q. Do you know what the maximum pumping time is associated with ICON's proposed groundwater remediation?

A. Not specifically, but I think it's about

14 years, probably.
MR. GREGOIRE: Let's put up ICON Exhibit E, page 16.
BY MR. GREGOIRE:
Q. So for the B bed, your maximum time is, what, 12.1 years; is that right?
A. 12.1 years.
Q. And for the A bed, we're going to go through that in a bit. But we have zones F through J on this page, which looks like your max is about 6.2 years; is that right?
A. That's what it says.
Q. Is that -- does that 6.2 years, does that overlap with the 12.1 or is that an additional 6.2 years on top of the 12.1?
A. Again, you'd have to talk to Jason about this. This is his portion of the report. I'm not sure what he had in mind as to how he's going to phase or turn on the system. But generally the most efficient way to run these things is to induce a flushing front of -- particularly out here where we've got such freshwater on the southwest side at the groundwater AOI. So it would be prudent to try to pull the freshwater in from the southwest to assist in flushing. So that

could go into the staging of the different zones to -- in other words, which parts of the remediation system get fired up.

So I don't anticipate everything running all at the same time. I think you generally try to induce a flushing front typically.

Q. You --

A. But again, I didn't -- I wasn't involved with that aspect of the design.

Q. Has ICON ever been part of a pump and treat with a reverse osmosis system that involved 450, 400 wells, 500 wells and above?

A. No. No. All of the pump and treats that we used to address chloride contamination thus far have involved either blending with produced water or, quite honestly, diluting in the surface water retention ponds are within discharge limits.

Q. That's --

A. Which is a good option if have you produced water available to blend with.

Q. Well, that's what ICON proposes to do in this case, is to perform a pump and treat groundwater remedy that includes a reverse osmosis process to treat the constituents of concern; is

that right?
A. And that's appropriate, yes. And the purpose of that is to -- to perform a volume reduction of the total water to be dealt with and to get the salinity high enough to where it's compatible with an injection zone. Because you could have problems injecting water that's too fresh into an injection well, which would induce biofouling and swelling of the interstitial clays. Those types of analyses, I used to -- I used to do at Core Laboratories. We -- you know, that's a real thing.
Q. So ICON proposes a groundwater remedy, pump and treat remedy, that includes reverse osmosis, that incorporates 471 recovery wells. Is that your understanding?
A. Yes.
Q. You have never done that in Louisiana; is that right?
A. Not that magnitude and we've never used an RO unit; correct.
Q. So you've never --
A. But we have done numerous groundwater recovery projects. This is simply scaled-up.
Q. So ICON's never implemented a pump and

treat system in Louisiana that uses a reverse osmosis system, regardless of the number of recovery wells that it includes?

A. Yeah, I mean, that's -- the use of an RO system, it's not a big deal. I mean, that's a part of a treatment train. All of our treatment trains for our groundwater recovery projects are designed and tailored to the contaminant distribution at hand. It could involve most of our -- our gas station sites typically include an air stripper to deal with the petroleum hydrocarbons; and if there's heavy metals, like lead, you can have a granular-activated carbon. We've been pumping and treating PCBs that are flowing into the Capitol Lake here in Baton Rouge since, shoot, I want to say 1994. And that's granular-activated carbon. That's an old Westinghouse facility.

So the treatment train is just -- it's -- it's integral to treating the recovered contaminants, but it's -- the fact that we're proposing an RO system unit, it's appropriate for the chlorides that are present as a contaminant. It's not a big deal. I've operated RO units before, just not in a groundwater treatment

facility.
Q. Haven't used one, hadn't done a pump and treat, though, with reverse osmosis in Louisiana?
A. No.
Q. No one at your shop -- at ICON; that is -- has done that?
A. That's correct. It's not a big deal. Because I ran an RO unit up in Vermont for an ultrapure water filtration for wafer chips and it's a treatment unit. It's got pressure -- a pressure differential, you've got to backwash it at a certain schedule. It's like any other treatment train. Not a big deal.
Q. So you were asked questions earlier about whether you ever testified in a limited admission procedure. We're here because of Act 312. You understand that; right?
A. Ultimately, yes.
Q. Okay. And it was pursuant to an admission; is that right?
A. That's correct.
Q. You've appeared, you've testified twice, if I'm not mistaken, before the Office of Conservation in a public hearing involving Act 312; is that right?

A. Correct.
Q. Poppadoc?
A. Yes.
Q. And Vermilion Parish School Board, East White Lake case?
A. That's correct. I think those were both before limited admissions.
Q. They were subject to Act 312, were they not?
A. That's correct.
Q. The jury determined in both of those cases whether there was environmental damage and who was responsible for it, and the matter was referred to LDNR's Office of Conservation for an Act 312 hearing?
A. That's correct.
Q. Same thing we're here for today?
A. That's correct.
Q. So what type of groundwater remedy did you propose in the Poppadoc matter? Do you remember?
A. I don't remember. It's been too long.
Q. You proposed a pump and treat.
A. Well, that's appropriate. I mean, that's --

Q. For arsenic. Arsenic was the main constituent of concern. Do you remember that?
A. I do not, but I'm not surprised because arsenic was a driver out there.
Q. So LDNR, the panel, did not select either the responsible party's plan, which was Chevron, nor your plan. Do you remember that?
A. That's correct.
Q. They chose their own plan?
A. That's correct.
Q. At the end of the day, do you know what the panel concluded about your groundwater plan?
A. I don't recall.
Q. Do you know how long your plan proposed for a groundwater remediation?
A. It's been too long, Vic, I don't recall.
Q. Do you dispute that it was 12.5 years?
A. No.
Q. And what do you propose here? What is your groundwater remediation? 12.1 years, isn't it?
A. That's correct.
Q. Did the agency, did Conservation not conclude that your plan was unreasonable?
A. They may have. I don't recall

specifically.
Q. Do you dispute that the agency concluded that your plan would overly -- would be overly intrusive and require expensive actions to be undertaken?
A. I don't recall that.
Q. Do you recall that that was signed, that most feasible plan, by the commissioner of conservation at that time, Jim Welsh?
A. I remember that.
Q. Tell us a little bit about the concrete bathtub that you proposed in the East White Lake most feasible plan hearing.
A. Concrete bathtub. East White Lake is a mess. The subsurface is -- the top of the Chicot comes in there at a depth of about 30 feet. There's a peat zone that exists from about 4 to 15 feet, thick layer of peat that is saturated with produced water. I'm talking saturated. These pockets of produced water have leached into the underlying groundwater. That's a situation I was mentioning earlier that's analogous to North Louisiana, where you've got a great thickness of high H -- SD of the Chicot Aquifer available to dilute leachate that entered into the aquifer.

The plume is huge. It goes for miles. It's a mile and a half wide and goes for miles.

And it was an innovative proposal to isolate -- to attempt to isolate by pressure-grouting, to isolate all of that salt-laden peat to prevent additional leaching instead of going out there and digging it all up. And it was rejected as, I guess, an unproven technology.

And it was based on some grouting work that ICON has done at facilities to stop seepage in levees at some industrial facilities. So we had experience with the grout technique. I thought it was a good innovative proposal to try to isolate and prevent leaching, which is continuing to this day.

Q. We'll take a look and you've explained what you proposed in that most feasible plan. So let's read what it -- let's start at the prior page so we can get the full context.

It says here: "Plaintiffs' proposed solution to prevent chloride migration from groundwater in the peat zone is to physically isolate and contain the chlorides in place by using a grout floor and walls beneath the peat zone to prevent downward migration in the groundwater aquifer below."

"Mr. Miller, whose proposal this is, has never seen anything like this attempted in Louisiana. In fact, there is no evidence that anything comparable has been tried anywhere in a marsh setting. Testimony lacked definitive proof that the untested process of pumping vast amounts of slurry concrete under significant pressure into the marsh will not irreparably harm the marsh environment during the installation process."

At the end, it says: "LDNR has determined this proposed remediation plan to be unreasonable and, thus, not feasible at this time"; is that right?

A. That's what it says.

Q. And that was signed by Commissioner Ieyoub; is that right?

A. That's correct. So we sacrificed the Chicot Aquifer to prevent a potential impact to the marsh.

Q. Do you -- are you aware of the benzene monitoring at the East White Lake property or the monitoring for benzene levels in the --

A. I am aware of that, yes.

Q. Do you dispute that those levels have attenuated?
A. No. No.
Q. And you attributed those benzene levels to an old Union Oil Company of California operation, did you not?
A. Yes.
Q. And about how long ago was that operation?
A. Man, I don't remember, Victor. I think that was probably the '50s. Somewhere in there.
Q. It's an old legacy operation, isn't it?
A. That's correct.
Q. And benzene was monitored in a Class 2, was it not, Class 2 aquifer out there?
A. That's correct.
Q. And we no longer have benzene levels that exceed the MCL?
A. I haven't looked at the data in a while, but if that's what you're presenting, then I won't dispute it.
MR. GREGOIRE: That's all I have. Thank you.
MR. CARMOUCHE: Can we take a restroom break?
JUDGE PERRAULT: Yes. We'll take a ten-minute break.

PANELIST OLIVIER: Can we take a 15?
JUDGE PERRAULT: We'll take a 15-minute break. We'll come back at 2:55.
(Recess taken at 2:40 p.m. Back on record at 3:06 p.m.)
JUDGE PERRAULT: We're back on the record. It's February 9th, 2023. It's now 3:06 and we're beginning the redirect of Mr. Miller. So please proceed.

REDIRECT EXAMINATION

BY MR. CARMOUCHE:
Q. Mr. Miller, good afternoon.
A. Good afternoon.
Q. You were asked a lot about litigation report versus your most feasible plan. Do you remember that?
A. I do.
Q. There are different requirements for a litigation plan than there are for a Chapter 6 plan; correct? In general?
A. In general, yeah.
Q. Your litigation report had data and your litigation report was issued September 30th of 2021. Does that sound about right?
A. I guess so, yes.

Q. I looked it up. I looked it up.
The ICON most feasible plan was issued October 14th, 2022.
A. Yes.
Q. Okay. So there was a lot of work done in conjunction with Chevron, which was done after your litigation report. There was a lot of work done after Chevron admitted, not only to a federal judge but to the state of Louisiana, that they contaminated both the soil and groundwater to a point that it couldn't be used for its intended purposes, and that's when you created your most feasible plan; is that correct?
A. That's correct.
Q. You were also asked: Did you talk to Mr. Henning? Did he tell you his intended use?
Your job, Mr. Miller, is to follow Chapter 6 and apply the rules and regulations when we do an applicable -- when we do a feasible plan; is that correct?
A. That's correct.
Q. Is there anywhere in the law -- not the law, I'm sorry, you're not a lawyer.
Is there anywhere in the rules of Chapter 6 or RECAP under land use that says that

you have to determine a landowner's particular use of a property to determine if it's going to be safe for the public for the next hundred years?

A. Look, when it comes to future use, as I said in my deposition, I don't think even Mr. Henning knows how this property's going to be used in another 30 years. Do you know how your kids are going to use what they inherit from you? You don't know. The future's unknown. So my goal is to clean it up for any potential use of the property. That's the goal.

Q. Which is what RECAP says you have to if you classify it as nonindustrial. So there's -- the only determination is industrial, nonindustrial?

A. That's it.

Q. And nonindustrial takes into account every possible future use that this property could have?

A. That's correct.

Q. He asked you if you did a RECAP evaluation of the groundwater. Do you recall that?

A. I do.

Q. Okay. You have done an analysis under

RECAP to classify the shallow zone; correct?
A. That's correct.
Q. And you come to the conclusion, with all the data we discussed -- and I'm not going to go over it again -- that it's a Class 2 aquifer?
A. Without a doubt, yes.
Q. A usable aquifer in the state of Louisiana?
A. Yes.
Q. A useable aquifer that a court order said needs to be remediated for its intended purposes?
A. Yes. Which, if I'd have gone the RECAP route, RECAP says that if your background locations exceed your drinking water standards, you can default to background. Well, background is the 29-B standard, which would get me right back to 29-B regulations. So it's kind of pointless to go through the RECAP process.
Q. And that's what you did. The groundwater remediation is to even a level of chlorides above what you think it's naturally going to be?
A. Yeah.
Q. Is that correct?

A. That's correct.

Q. It's your opinion, with all the data we have under 250, that this aquifer is going to be under 250, but you're only remediating right now your numbers to 428?

A. The 428 is a calculated background number that is the basis for our pore volume calculations. That doesn't mean that's the number we're going to end up with at the end of the remediation. I mean, it's, again, pulling -- flushing front, I'm confident you can achieve under 250 milligrams per liter based on those five wells that are on the southwest upgradient side of an AOI. That's all part of ongoing groundwater remediation that we always do.

Q. He showed you your cross-section A and your words "possible disturbed zone area blowout"?

A. Yes.

Q. And we also talked about H-10?

A. Yes.

Q. All you're suggesting to this panel is that if there is, which you can opine whatever you want to opine and I think you opined that there is -- all you're saying is: To protect the Chicot Aquifer as a sole source of drinking water in the state of Louisiana, shouldn't we at least sample it?

A. I think we ought to check it, for sure.

Q. Very simply, when you classify, when you go out and take a background sample, when you call it BG when you send it to a lab, it's easy to go back and say: Yeah, but you called it a background. But isn't it true, as a scientist, Mr. Miller, that you have to, once you collect all of the data, look at the data, examine where the possible things that you know to determine an actual background of an aquifer?

A. Yes. Characterizing background groundwater concentrations is a lot harder than it seems. I've seen USGS studies that go out and sample a bunch of stuff, and the implication is that we're sampling to show you what the range of numbers are, but invariably, nobody knows whether there's been an anthropogenic impact on one or two of those wells. I've seen USGS publication data that will have an elevated result in an area that I know has had historical impacts that they weren't aware of. Then I've seen a USGS discover those impacts themselves. For instance, there's a publication of the groundwater resource of the

Delhi area. And they recognized right away that there was a problem in the MRVA up there resulting from historical seepage from production pits, and they flagged it and identified it.

So yeah, that's -- putting a BG label on it, it shows the intention that's where we wanted to go, but you don't know what you're going to get until you sample it or what could have impacted anything at that location.

Q. Mr. Gregoire talked about quality, yield, and that this aquifer's not going to be used, not being used. You were involved in a case where DEQ -- and I think that was not too long ago -- where they expressed their opinion about if you should just ignore an aquifer in Louisiana if it's poor quality and low yield; is that correct?

A. Hero?

Q. Yes, sir.

A. Yes.

Q. I'm going to show you. This was in your slide show. We just didn't cover it.

So this is from DEQ to the Office of Conservation; is that correct?

A. That's correct.

Q. It says, "Qualitative descriptions such as poor water quality or low yield should not be used to determine groundwater classification as defined under RECAP." Is that what it says?

A. It does.

Q. I want to make -- I want to just clarify something. You were shown or asked about your additional assessment of the B bed, and I want to make sure it's very clear to the panel that you're not saying that additional assessment needs to be done to the B bed to classify the aquifer?

A. No.

Q. Okay.

A. We've got an abundance of data that I've gone through. I'm comfortable.

Q. I could show the sentence. He didn't read the next sentence that I've asked the panel to read. The next sentence said: "To determine horizontal and vertical extent of the contamination."

A. Yeah, that was the goal of the additional characterization work.

Q. And that was the next sentence.

A. Yes.

Q. You were asked about your slug test. You sat through Mr. Angle's testimony?

A. Yes.
Q. Okay. We received the -- a draft copy from this wonderful court reporter.
Some typos.
But I want to show you. I don't think there's a disagreement, but I want you to make sure you heard what I heard.
So question: "The methodology used here, so did Mr. Miller, that's an acceptable methodology by DEQ to determine the yield and the classification to determine if remediation needs to be done?"
"Are you talking about slug testing in particular?"
"The tests that y'all performed."
It says: "Yes. The slug tests are recognized-- are a recognized way to gather hydraulic conductivity data to classify the water-bearing zones."
A. Yes. I agree.
Q. So Mr. Angle, Chevron's expert, agrees there's no dispute, as we sit here today, that the methodology that you used and Mr. Angle used is accepted by DEQ to classify an aquifer?
A. Yes. And that's -- the classification

using a pumping test is a pretty rare thing at DEQ. Considering the amount of projects that they regulate, it's pretty rare.

Q. Almost finished.

Chevron wanted to bring up two cases dear to my heart. Spent a long time with both of them. East White Lake lasted sixteen years.

Let's talk about Poppadoc first. Okay?

Chevron's lawyer stood up and said that your groundwater plan -- and showed you the most feasible plan and said that your plan was unreasonable.

A. Yes.

Q. That -- that dealt with what groundwater in Concordia parish?

A. That was the MRVA.

Q. Drinking water aquifer in that part of Louisiana?

A. Yes. GW-1 classification.

Q. The driving constituent in that aquifer was arsenic?

A. That's correct.

Q. After the most feasible plan hearing and after the ruling by the Office of Conservation, tell this panel what happened.

A. So the big difference throughout the Poppadoc trial had to do with whether arsenic was anthropogenic, which it looked to me like it was from historical oil field operations. Chevron's position was that the arsenic was naturally occurring. And they successfully presented that at the hearing.

Q. Same experts they have here today?

A. Correct. And then after the ruling, Chevron had a submittal. I think it was at the Wagner property, in the same field adjacent to the subject property, where it had to do with sampling; and Mr. Angle, on behalf of Chevron, made a submittal to the DNR, again, that -- urging closure of elevated arsenic concentrations in groundwater around that pit, claiming they were naturally occurring.

And Dr. Mary Barrett, who had been on Chevron's team for the Poppadoc trial, submitted a technical memo to the Department of Conservation. It was strange. It was kind of like a confession to the DNR that Chevron and their -- their team was -- had a document and she provided an attachment of the document that Chevron, indeed, had used arcenical corrosion-inhibitors in the

'40s in the field. W-41 is specifically what was on the AFE, which was proof that they did, indeed, use the arsenical corrosion-inhibitors, which likely got back-flowed into the pits, which was the likely source of all of this elevated arsenic in the field. So I think Dr. Barrett -- I don't know what prompted her to do it, but it was a submittal that I saw a copy of.
Q. Dr. Barrett had worked for Chevron for at least ten years prior to that and actually testified at the Poppadoc trial; correct?
A. That's correct.
Q. After she wrote that letter, did you ever see her appear on behalf of Chevron again?
A. No, I did not.
Q. And that letter is in the files so they could go -- this panel could go look at to see maybe really how unreasonable you were?
A. (Nods head.)
Q. Is that correct?
A. That's correct. I mean, it was -- a document was withheld through the trial.
Q. Let's talk about the East White Lake, the crazy bathtub. The easy thing for you to have done, Mr. Miller, is to tell the panel you want to

excavate the marsh and you could have came up with a $15 million cleanup. That's the easy thing to do; right?

A. Yeah. It's hard to be innovative in this industry.

I felt good about the proposal. We had experience grouting at the -- it's a problem out there, man. There is pure produced water hung up in this peat zone and it continues to flush out of it. As a matter of fact, Chevron went and stirred up a pit next to a monitoring well after the dust had settled with the hearing and all that and, lo and behold, the chloride values in that well skyrocketed because they poked around at the peat. It's there. And it's going to be there for decades.

Q. But they excavated a pit?

A. Yes.

Q. And they were supposed to monitor the groundwater. They had already sampled the groundwater; right?

A. Yes.

Q. Which was close to the area that you're talking about?

A. The well was in the peat, like just

below the peat zone.

Q. So after excavating the pit, because the peat zone was still there saturated with chlorides, the chlorides shot up?

A. That's right.

Q. So as we sit here today, because that plan -- and he read it, but he read it fast. Mr. Ieyoub said "at this time," which was six years ago. And a lot of sampling has been done since six years ago; right?

A. Yes.

Q. That sampling has been done?

A. Yes.

Q. And as we sit here today, your opinion was that the peat zone, the saturated chloride was going to continue to contaminate a drinking water aquifer of the state of Louisiana if something was not done, and DNR said: We'll excavate the pit first; right?

A. And see if it had a beneficial effect on that adjacent monitoring well.

Q. Which would determine if the peat zone was leaking into the aquifer; that was part of it?

A. I think the intent was to remove the source of the pit materials and then observe a beneficial effect to the adjacent monitoring well. But in the process of closing the pit, they stirred up around the peat layer and it released a bunch more of that bound produced water hung up in the peat layer. It's a sponge full of produced water. I mean, it's an unfortunate situation.

Q. Unfortunate for the marsh or the school board in the state of Louisiana, unfortunate; right, Mr. Miller, unfortunate for a useable drinking water aquifer in the state of Louisiana that we keep, for some reason, writing off. And you talked about it earlier.

A. Yes.

Q. Time to wake up. Maybe, maybe the bathtub wasn't a bad idea, was it?

A. I thought it was a good idea.

Q. It was way cheaper than excavating?

A. I think it could have been done in a manner to -- I mean, you would have definitely disturbed the marsh at the time of installation and the scarring would have been there probably for five or six years. But the marsh would -- you know, it healed from all of the flow lines from the oil field out there eventually. The same thing would have happened and you would have had a containment of this source material. I stand by that as a feasible alternative to this day.

MR. CARMOUCHE: Mr. Miller, I thank you for your integrity and honestly, and that's all the questions I have.

JUDGE PERRAULT: Does the panel have any questions?

PANELIST OLIVIER: Yes, we do.

JUDGE PERRAULT: Please proceed.

PANELIST DELMAR: Chris Delmar, Department of Conservation.

Mr. Miller, I've got one or two questions about connectivity between the zone A -- the A bed and B bed.

THE WITNESS: Yes.

PANELIST DELMAR: One thing is I kind of saw it with your isopach map and it looks -- looked like two zones are sort of at different levels and might be connected, but I didn't see anything that was definitive, to me. And one thing that I -- I guess where I'm going with it is: Do you think a pump test would help show that if -- like -- excuse me.

If you pumped from the B bed of the

zone, would you -- do you think you could measure any effect in the A bed to show connectivity between the two?

THE WITNESS: A pumping test could definitely be designed to -- not only to measure the inter-connectivity of lenses within a common aquifer, but you could also -- you can also measure the effectiveness of the semi-confining unit either above it or below it. Those pumping test designs are out there and have been done in the past.

But there's really not a dispute that both zones are operating as a common aquifer, and it's kind of a fundamental assumption to both the landowner's plan as well as the defendant's plan because all of the isoconcentration data, the groundwater data, is being mapped holistically as a common aquifer. The potentiometric data is being evaluated as a common unit. All of the data has been treated that it is a single aquifer system.

And I believe that it is because of the close relationships the hydraulic head in all of the nested wells that we do have out there. But there's no doubt a pumping test will always tell you more. But I'm fully confident this thing is functioning as a single aquifer. It's just got two permeable beds and that provide most of the hydraulic conductivity and most of the storage of the water available for use. It was worth mapping it out in an isopach, in my opinion.

PANELIST DELMAR: Also, this is more of a curiosity for me. The blowout zone that you sort of -- you drew as a hypothetical.

THE WITNESS: Disturbed zone.

PANELIST DELMAR: Disturbed zone, yeah. Were any water quality samples taken from the nearby water well that was drilled into the -- into the Chicot here, specifically the registered well 6649-Z?

THE WITNESS: That well had been plugged.

PANELIST DELMAR: So no water was able to be --

THE WITNESS: That was a plugged location. That's an old rig supply location.

PANELIST DELMAR: For some reason, I just assumed it was still viable.

THE WITNESS: No. In all of my work, you

know, ICON's product, plugged water wells are going to be colored sort of a light brown, whereas active wells, both in plain view maps as well as cross-sections, are blue. So just for your information, that's kind of how I sort them out.

No, unfortunately, those wells have been plugged. And really, even the unregistered well, which is 300 feet deep, won't answer the water quality at the top of the Chicot. We really need a test right at the top of the Chicot adjacent to that blowout area.

PANELIST DELMAR: I guess, in that regard, saltwater typically is more dense than freshwater. Would there be, at the bottom, do you know, sort of, if the blowout's coming from the bottom up, wouldn't there be evidence at the bottom of the Chicot?

THE WITNESS: You're absolutely correct because I've done six breach assessments resulting from pumping reserve pit fluids, you know, annular disposal they'll pop back up to ground surface. And that is recognized. There's a base separation in oil and gas releases. The produced water's heavy. It's going to flow like a DNAPL. It's heavy. That's where it's going to go. The petroleum hydrocarbons are going to have a tendency to float. It's going to be an expensive endeavor to go down and test dense fluids at the base of all the individual sands of the Chicot. That's going to be expensive.

PANELIST DELMAR: That's fair. I forget the Chicot is actually a very thick aquifer.

THE WITNESS: It's very thick. However, it makes perfect sense to look at the very top because we're seeing benzene in H-12. Benzene, at 80 years after the blowout, still exists. The question in my mind is, is there a continuing source of condensate that's still bleeding up at a low rate that could be pooled at the top of the aquifer? It's not an unreasonable thing to put a well in there and check for it. But if you're going to gear up and start looking for the heavies at the base of the aquifer like we did at East White Lake, which we did find dense liquids -- because they had three SWD failures at East White Lake. They ended up pressuring up one of the water wells at the doghouse, you know, where the personnel would work, and gas started flowing and gas and sand came out in the sink. And we do find evidence of a dense layer at the base of a water-bearing unit, but that's a big deal to test for those things. You know, those are -- like we did at the Dynamic site. The easiest way to do it is to set carbon steel casing and perforate oil-field style. That's the most cost-effective. But it's a big deal. It's not cheap.

PANELIST BROUSSARD: Mr. Miller, Gavin Broussard again.

So kind of going off of Chris's questioning on the A and B bed, my question is towards your yield calculation. So you've broken it up between A bed, B bed, found your average or geomean average for each bed; correct?

THE WITNESS: That's correct.

PANELIST BROUSSARD: And then added it together to get your total water-bearing zone yield?

THE WITNESS: I didn't even -- I didn't even add it. What I did is I evaluated them separately for the purposes of efficient contaminant recovery, again, to address differential yields between the A bed and the B bed to a commonly penetrating well. I didn't want that to occur. So I'm recognizing there's a difference of yield between the two beds. What I'm saying, in doing that evaluation, the hydraulic conductivity data, as I showed on that isopach of the B bed, is all very high. So if you just took that one bed in isolation and the A bed didn't even exist, that's a slam dunk GW-2 based on even a geometric mean evaluation like I went through. It's no doubt GW-2.

So if you add to that the yield you would get from the A bed in the event that you put a fully penetrating water supply, well, it would be an additive-type thing. But you don't need to add it in order for it -- the classification is based on a yield of greater than 800 gallons per day to a well.

So if you can put one well in the

aquifer and sustain a yield of 800 gallons per day, that meets the qualifications of a GW-2. And so you've got to look at the sustainability. And that's where I was looking at all of the surrounding very-high-predicted yields creates an environment that is conducive to sustain that yield.

And you had asked, I think, about whether RECAP has like a threshold for the sustainability. And I don't know if this is going to answer your question, but if you look in Appendix F, the Cooper-Jacob approximation method has a number of assumptions. One I said was -- HC was .75. So it's not -- you're not fully pumping what the well can produce; you've got a little cushion there.

But most importantly is, the Cooper-Jacob equation, I think they're assuming a seven-day time duration for the -- to calculate the resulting drawdown and resulting yield. And so you could kind of look at that seven-day as that's sort of the time reference for a sustained flow that is inherent in the Cooper-Jacob seven-day assumption of a test. But that's the only place that I can really point to in RECAP where a time is mentioned in relation to sustainability.

PANELIST BROUSSARD: So there's a bunch of numbers here. And I guess the question is, if you are -- if you're calculating a yield, an average yield for the entire zone, what is that number on your handout here?

THE WITNESS: I would -- I would --

PANELIST BROUSSARD: Or how would you go about calculating it?

THE WITNESS: I would -- if you wanted to come up with a single number for the entire zone, I would do like you suggested. I would add the single-number yield calculated for the B zone to the single-number yield for the A zone because the hydraulic conductivity testing is reflective of the hydraulic properties of each of those individual beds. So that's all we're doing is describing hydraulic properties of that hydrostratigraphic unit.

So you could put a well just in the B

bed and that's the yield you're going to get. If you put a fully penetrating bed, you're going to get contributions from both of those beds to that same common screened interval. You can play with statistics all you want, but ultimately, that's what -- practically what the aquifer's going to give up. From a regulatory standard, all you've got to do is demonstrate you can sustain a yield to one well at 800 GPD to meet the definition of a GW-2.

PANELIST OLIVIER: This is Stephen Olivier. I do have a couple questions. One of them's kind to going back to the leachate test that we talked about earlier. I know you pointed out, I think, H-16 that y'all got an exceedance for leachate --

THE WITNESS: That's correct.

PANELIST OLIVIER: -- for chlorides. And I went back and looked at some data just to see -- I also see that y'all noted it at H-9 and H-12. That's the three locations that I saw where leachate exceeded your 500 threshold you pointed out earlier for chlorides.

THE WITNESS: That's correct.
PANELIST OLIVIER: So just for confirmation, it was pretty close to some screening on some boring logs. Were those taken in a saturated or unsaturated soil zone?
THE WITNESS: The samples that were analyzed for 29-B leachate chlorides, you're asking?
PANELIST OLIVIER: Yes; correct.
THE WITNESS: I would have to look at the individual samples to answer that. So the boring logs would probably best describe what the core samples looked like.
PANELIST OLIVIER: Do you think that might be a better -- like Mr. Sills, I think you mentioned he might -- was y'all's soils guy. Is that something maybe better for him to answer?
THE WITNESS: Well, I did the geology. So I just can't sit here and tell you that I remember what the field descriptions at each one of those samples was. But I just -- I don't know. I don't know the answer to that. What I can say is, you know, I think it was -- it was H-16 was one of the...
PANELIST OLIVIER: Yes, sir.

THE WITNESS: So when you look at the -- obviously, the groundwater chloride contaminations at H-16 make a bull's eye of high readings, which it matches where we're finding the remaining source of leaching soil. So those two -- that's what I tend to do is look: Where are the mass of potentially leachable soils in relation to where we're seeing the highest groundwater concentrations? And they almost always match, because, obviously, you're defining where the source of potential leaching material is, you ought to expect to see a correlating elevated bull's eye of the plume at or near that location.

Sometimes you'll find it down-gradient if you have a strong gradient. I think there were exceedances by the sinkhole as well. And I think Jason will get into that.

PANELIST OLIVIER: Yeah, I think -- I think, from when I looked at it, I think maybe H-12 and 9 were next to the ponded area and then 16 might have been an area.

THE WITNESS: To the east.

PANELIST OLIVIER: It was either four or

five, I don't remember which one, but it was in one of those.

I guess to further that question, then, are you aware of any site-specific for this Henning Management property done where there was any evaluation or any survey done on this property in comparison to SPLP and leachate that would give a definitive determination on which one would be maybe more representative than the other for reporting leachability constituents, chlorides and barium and, in this case, for this site, from soil to groundwater?

THE WITNESS: I can definitively sit here and, for chlorides, you can ignore the SPLP because it has no relation to reality.

PANELIST OLIVIER: I mean, well --

THE WITNESS: I can tell you that.

PANELIST OLIVIER: I know I did hear your testimony about Reliable Landfill and stuff, but I guess I was referring to this site, to Henning Management. Was anything done evaluation-wise between the two on this site to show: Hey, this one's more representative than this other one on this Henning

Management property? And that would -- and I guess the leachate, I think y'all only took it on chlorides. So I guess it would be applicable for chlorides.

THE WITNESS: That's all I can speak to is the chlorides. I mean, if you're not going to be able to, like, do a side-by-side comparison of 29-B leachate chlorides and a correlating SPLP chloride to see -- to compare how the failures match -- because there's never going to be a failure in the SPLP. It just strictly cannot predict leaching. It can't. I'm sitting here 100 percent honest. The test doesn't work. 29-B works.

Now, what I did in -- I did a comments paper to the feasible plan. In there is an appendix where I went through the RECAP method to calculate a site-specific partitioning coefficient, and that's based on where you have a groundwater result and you have a total soluble chloride result in the same interval. And I did a calculation there following the RECAP protocol in the appendices for Area 4 and 6, I think it was.

So one of them was close to the sinkhole. The other one was probably close to this H-16 area. And that resulted in, you know, a dilution factor of something like 2.2, which is -- it's pretty consistent with the 29-B leachate chloride test that is applying a dilution factor of 2 to the 250 milligram per liter drinking water standard because the threshold criteria is 500.

So in that aspect, that RECAP appendix method matched almost perfectly the 29-B chloride assumption of a dilution of 2. It's funny, these things all work out because chloride's so soluble. It's a conservative tracer, so what you're playing with is nothing but mass balance equations. So it's easy to check. It takes some effort, but it's -- it's uncomplicated.

PANELIST OLIVIER: Okay. And you know, going from leachate to property use or future intended use of the property, you know, I'm asking you because this is off -- I saw the ICON comments to the Chevron most feasible plan and I saw you were one of the individuals who signed this report.

THE WITNESS: Right.

PANELIST OLIVIER: And so just for further clarification, when I was looking here on the section for remediation within the current effective root zone, in here, y'all pointed out that Chevron claimed the root zone to be about 1 foot. And so there's a statement in here that reads: "Limiting the remediation of soil constituents to 1 foot will restrict the future use of the property and not allow the owners to grow other crops with deeper rooting depths or recontour elevation of the property by digging ponds and using that dirt as fill for residential development." And so I know we already kind of talked about, in this hearing so far, ponds and that sort of thing, and we kind of heard testimony on that.

But I feel like it was never really addressed about the fill for residential development. So for clarification, are you aware of exactly -- or can you explain what that fill material would be used for? Has anybody expressed to you that it would be used for, you know, building a subdivision or maybe a residential house pad foundation or -- can you elaborate on that a little bit more?

THE WITNESS: Yes. And again, I'm going to qualify. I've never spoken to Mr. Henning about future use or anything like that. Again, we approach these things from not knowing what's going to happen in another couple of decades. But you'll notice that developers who build a neighborhood, these days particularly, they've got to get permitted and part of the stormwater management is a stormwater retention pond. Those are part of the permitting process. You'll see in all of these neighborhoods that are going up. And it's standard practice that they take the spoil out of those stormwater management ponds and that gets recontoured into part of where the house foundations are going to go. That's kind of a standard practice because it's dirt you've got to remove, you need dirt for the foundations. It makes sense to recontour the whole property, and it's done here in Louisiana. It's done in extreme instances in places like Florida where they -- man, they recontour it like -- it's insane how much they really move for those neighborhoods. But that's become a standard practice for a neighborhood development. So if you don't consider in the future how much stuff gets recontoured, you're not addressing the potential very, kind of, likely potential future use.

Man, I dug a pond on my property. Now I've got two hills that didn't exist before and I've got a 10-foot-deep hole now that wasn't there before. People do that all the time.

PANELIST OLIVIER: I understand. And I'm only asking this because you mentioned it. And you stated you didn't talk to the landowner. So this future intended use of the property, did the landowner express this type of use of the property?

THE WITNESS: You know, I don't know. I didn't talk to him and, again, as I said earlier, I'm not sure if even Mr. Henning knows what his kids are going to use this property for in the future. You just -- man, life goes on and subsequent generations and things happen in areas you don't expect where they're going to happen. I mean, population keeps growing, pressure on the land keeps increasing. You know, who knows? So you leave -- it's just like when we close a site under an industrial classification. We've got to put a deed restriction on that so that if the use ever changes, the deed at the courthouse requires that you've got to go and reevaluate the contamination that's left at the site.

That's a method of trying to address an unknown future potential use to close an environmental issue today that still kind of protects what may happen in the future that's not known. That's the mechanism that's typically used.

PANELIST OLIVIER: And in the same subject matter, what I just read, it also mentioned to grow other crops with deeper rooting depths. Do you have any idea of what other crops may be intended to grow on this property other than what's currently there? And I guess I'm just getting a question as to maybe how deep of a rooting depth that this would be referring to.

THE WITNESS: Man, I'm from Mamou. I grew up in that country and there was rice everywhere. We had wildlife, had the food for the wildlife. And in my lifetime, I've seen the amount of rice being grown replaced by sugarcane. It has happened throughout my lifetime. So probably, with the sugar subsidies and all that that are ongoing, people are reverting to sugarcane, which is probably a likely crop. Agri-South was a decision that came out of the Department of Conservation that ended up with, I think, an 8-foot-deep root zone. I've got a site where we've got sugarcane impacts that -- that's not in litigation, that HET and ICON are kind of overseeing, trying to do a flushing of the field out there. It's been ongoing for about four years now and that progress is really, really, really slow. But we're trying to see how much time it will take to work it out, so...

But the rooting zone, you know, LSU publications are 6 to 8 feet, is what's published.

PANELIST OLIVIER: So did you get, I guess, a -- I guess, so at 6 to 8 feet, is that what's being suggested here in this for particular rooting depths, is 6 to 8 feet was being suggested here by the deeper rooting crops?

THE WITNESS: I'm not sure it was -- that was a depth suggestion. I mean, it's just -- it's just like the oak tree, man. It's like I know live oak trees are -- man, those are -- that's a staple of Louisiana landscaping. Man, you know, you get four or five -- I'm sure those big live oak trees, those roots are going to end up at about 8 or 9 feet deep. I've seen them uprooted in the hurricanes and they're that deep.

So yeah, they may not be growing out there now. If someone builds a neighborhood, you can bet there's going to be some live oak trees out there.

So you know -- I can't answer what the appropriate depth ought to be. I think, you know, if you rely on maybe -- if you're saying sugarcane is going to be a likely future crop, you ought to look towards what you decided for Agri-South. You got a precedent there.

There's a ton of literature on rooting depths of various vegetation. I'm not an agronomist, but I am an expert in subsurface soil moisture. And I can tell you that I have seen the effects of evapotranspiration in a monitoring well situation where, in the wintertime when the trees lose their canopy, you actually see a rebound of a shallow water table. This was up in Tensas Parish. And in the spring, when the trees would leave-out, you would get this consistently depressed water table of a couple of feet. So in that instance, evapotranspiration was having a definite effect on the available soil moisture to the effect that it affected the water levels in the monitoring wells.

So I can tell you from that instance that that was a depth of about 8 feet to the top of where we were monitoring. So those things are real. Those happen.

PANELIST OLIVIER: That's all the questions I have.

JUDGE PERRAULT: Any other questions?
All right. Thank you very much.
THE WITNESS: Thank you.
JUDGE PERRAULT: You want to wait till tomorrow to start with your next witness?
MR. CARMOUCHE: We feel confident we're going to finish tomorrow.
(Discussion off record.)
JUDGE PERRAULT: Any outstanding issues for today?
MR. GREGOIRE: Yes, Judge. I just wanted to change the exhibit numbers on the two exhibits that I introduced with Mr. Miller. It makes more -- these are placeholder exhibit numbers, and these numbers would make more sense. Instead of Exhibits 158.1 -- actually 154 and 155 should be Exhibits 158.1 and 158.2.
JUDGE PERRAULT: So 154 will be 158.1?
MR. GREGOIRE: Right.
JUDGE PERRAULT: And 155 will be what?
MR. GREGOIRE: 158.2.
JUDGE PERRAULT: Okay.
Anything else before we recess for today?

MR. GREGOIRE: No.
MR. KEATING: I don't think so, Your Honor.
JUDGE PERRAULT: If there's nothing further, we're adjourned until tomorrow morning at 9:00 a.m. And we are off the record.
(Hearing adjourned at 3:54 p.m.)

REPORTER'S PAGE

I, DIXIE VAUGHAN, Certified Court Reporter in and for the State of Louisiana, (CCR #28009), as defined in Rule 28 of the Federal Rules of Civil Procedure and/or Article 1434(B) of the Louisiana Code of Civil Procedure, do hereby state on the Record:

That due to the interaction in the spontaneous discourse of this proceeding, dashes (--) have been used to indicate pauses, changes in thought, and/or talkovers; that same is the proper method for a Court Reporter's transcription of proceeding, and that the dashes (--) do not indicate that words or phrases have been left out of this transcript;

That any spelling of words and/or names which could not be verified through reference material have been denoted with the phrase "(phonetic)";

That (sic) denotes when a witness stated word(s) that appears odd or erroneous to show that the word is quoted exactly as it stands.

DIXIE VAUGHAN, CCR

R E P O R T E R ' S   C E R T I F I C A T E

I, Dixie Vaughan, Certified Court Reporter (Certificate #28009) in and for the State of Louisiana, as the officer before whom this testimony was taken, do hereby certify that on Thursday, February 9, 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 231 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 28TH DAY OF FEBRUARY, 2023.

DIXIE VAUGHAN
Certified Court Reporter (LA)
Certified LiveNote Reporter