Exhibit 157

IN THE UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF NORTH CAROLINA

IN RE:	:	Case No.:
CAMP LEJEUNE WATER LITIGATION	:	7:23-CV-00897
This Document Relates To:	:	
ALL CASES	:	

VIDEOTAPED DEPOSITION
OF
LAURA M. PLUNKETT, Ph.D., DABT

May 12, 2025 10:00 a.m.

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REPORTED BY: Sarah B. Townsley, CSR, CRR, RPR

STIPULATIONS

IT IS HEREBY STIPULATED BY AND BETWEEN COUNSEL FOR THE PARTIES HEREIN THAT THE VIDEOTAPED DEPOSITION OF LAURA M. PLUNKETT, Ph.D., WAS TAKEN BEFORE SARAH B. TOWNSLEY, CRR, CCR, CSR, RPR, CERTIFIED REALTIME REPORTER IN AND FOR THE STATES OF TEXAS AND LOUISIANA, PURSUANT TO NOTICE AND IN ACCORDANCE WITH THE FEDERAL RULES OF CIVIL PROCEDURE AS PROVIDED BY LAW, ON MAY 12, 2025;

THE PARTIES HEREBY WAIVE ALL FORMALITIES IN CONNECTION WITH THE TAKING OF THE DEPOSITION, WITH THE EXCEPTION OF THE SWEARING OF THE WITNESS AND THE REDUCTION OF THE QUESTIONS AND ANSWERS TO TYPEWRITING;

THE RIGHT OF THE WITNESS TO READ AND SIGN A COMPLETED TRANSCRIPT OF TESTIMONY IS SPECIFICALLY RESERVED;

COUNSEL FOR ALL PARTIES RESERVE ALL OBJECTIONS EXCEPT AS TO THE FORM OF THE QUESTION AND RESPONSIVENESS OF THE ANSWER AT THE TIME OF TAKING OF SAID DEPOSITION, AND THEY ALSO RESERVE THE RIGHT TO MAKE OBJECTIONS AT THE TIME THAT TAKING OF SAID DEPOSITION OF ANY PART THEREOF MAY BE OFFERED INTO EVIDENCE, WITH THE SAME RIGHTS AS IF THE TESTIMONY HAD BEEN GIVEN IN OPEN COURT;

SARAH B. TOWNSLEY, CCR, CSR, RPR, OFFICIATED IN ADMINISTERING THE OATH TO THE WITNESS.

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EXHIBITS

PROCEEDINGS:

LAURA M. PLUNKETT, Ph.D., DABT,

having been first duly sworn by the court reporter, testified on oath as follows:

VIDEOGRAPHER: We're now on the record. My name is Brian Bobbitt. I'm a videographer for Golkow, a Veritext Division.

Today's date is May 12, 2025, and the time is 10 o'clock a.m. Central time.

This video deposition is being held in Houston, Texas, in the Camp Lejeune Water Litigation, for the United States District Court for the Eastern Division of North Carolina.

The deponent is Dr. Laura Plunkett. Counsel will be noted on the stenographic record. Our court reporter is Sarah Townsley, and she will now swear in the witness.

(Witness was sworn.)

EXAMINATION BY MS. JOHNSON:

Q. Good morning, Dr. Plunkett. Thank you for being here.

A. Good morning.

Q. I just wanted to go over some, just housekeeping and things to go ahead and get us started. All right, I'm going to -- well, I'm sorry, let me go back. I

introduced myself before we entered the room, but just to introduce myself again, my name is LaCresha Johnson, representing the United States, and I'll be asking questions of you today, and I'll be asking questions, so please answer them to the best of your ability. If you don't understand a question, please let me know, and I will rephrase the question, and if you do answer the question, I will assume that you've understood it.

In normal conversation, it's typical that you may understand what I'm asking before I finish my question, but I would ask, just for the clarity of the record, for the court reporter to capture what we're saying, if you could let me finish my question, and I will, in turn, endeavor to let you finish your answer so that we can, you know, have complete question and answers.

When you're asking a question -- excuse me, when you're answering a question, please say your answers so that the court reporter can accurately transcribe them; so "yes" and "no", instead of "uh-huh."

Let's see. And you understand that this is a court proceeding, even though we're not in a courtroom and you're under oath?

A. I understand that, yes.

Q. And do you understand you're obligated to tell

the truth?

A. I do.

Q. All right. And, let's see, I am typically pretty good at talking at a reasonable pace, so like the pace I'm speaking now, so the court reporter can transcribe it, and, similarly, I spoke about interruptions. I will endeavor not to interrupt you while you're speaking; and once the deposition is complete, you'll be given an opportunity to read a transcript of your testimony to make any corrections. You will then be asked to sign it.

Also, if there are any ambiguities, like you don't understand a question, please let me know, and I'll try to clarify.

During the deposition, you may hear other attorneys say "objection." Unless your attorney instructs you not to answer, please answer the question after the objection has been made.

And is there any reason that you are unable to give your most truthful and accurate testimony today?

A. No.

Q. Is there any reason your memory might be impaired today?

A. No.

Q. And are you currently taking any medication that

might impair you?

A. No.

Q. Let's see. As far as breaks, typically, of course, if you -- please ask for a break if you need a break, and I would only ask that if a question is pending, that you answer the question before we -- before we go to break. Does that sound good?

A. That's fine, yes.

Q. And one more thing. So before we go any further, I just want to establish a few abbreviations that I use throughout the deposition, because I will get tongue-tied saying the name of some of these chemicals, so I will list them, and if you have any objections, you can let me know.

A. Okay.

Q. So when I say "TCE", I'm referring to trichloroethylene. When I say "PCE", I'm referring to tetrachloroethylene, or perchloroethylene. When I say "IARC", I'm referring to the International Agency for Research on Cancer. When I say "EPA", I'm referring to the United States Environmental Protection Agency; and when I say "NRC", I'm referring to the National Research Council.

A. That's fine. I'm familiar with them. I think I even use those in my report, so --

Q. Yes, so I just want to check, because I tend to get tongue-tied around the chemical names, so the abbreviations work much better for me.

I see you have -- did you bring any materials with you today?

A. Just a copy of my re -- and, actually, I brought the amended report, which is the -- you were served, I think two, three weeks ago, whenever --

Q. Oh, last week.

A. Okay. Whenever, yeah. Exactly, yeah.

Q. All right. And --

MS. LaMACCHIA: For the record, the amended report was served on April 22nd.

BY MS. JOHNSON:

Q. Did you do anything to prepare for today's deposition?

A. Yes.

Q. What did you do?

A. I re-reviewed my report, I looked at some of the references that are cited within my report; not everything, but some of them. For example, there's four or five studies that are --

VIDEOGRAPHER: Sorry, we have to go off the record. We're off the record at 10:06.

(Off the record.)

VIDEOGRAPHER: Time is 10:09 a.m. Back on the record, beginning of file 2.

BY MS. JOHNSON:

Q. Okay, we're back from our break. Let's see, I believe the last question I asked, which, normally, I would ask the court reporter to read it back, but we were just going over deposition preparation. I'll ask it again so you can give a fuller answer.

Did you do anything to prepare for today's deposition?

A. Yes.

Q. And what did you do?

A. So I re-reviewed my report, went through it. I looked at some of the cited references within the report. They're cited in the body, particularly ones that are in groups that you might confuse. So, for example, there's, I think four or five by Dr. Bove, so I looked at those again to make sure I understood which one -- they all have similar topics, but different specifics to them, so I looked at those again. I looked again at the -- some of the guidance documents. EPA's mixtures, guidance from '86. I reviewed the -- I was recently provided the deposition testimony of Dr. Gilbert, and also Dr. Goodman, so I looked at those. I didn't read every word, but I skimmed through those to

see what kinds of questions were being asked by both sides. I think your side, the defense -- sorry, the government took the deposition of Dr. Gilbert, and the plaintiffs took the deposition of Dr. Goodman, so I looked at those, and I think you were provided a supplemental list, so you know that those are new things that I have since I filed my report back in April. And, let's see what else do I do? I gathered my bills to make sure that we had -- you had all the bills, because that was something that I know that needed to be provided. I think you were provided those ahead of time; however, yesterday, I had a short meeting, maybe an hour and a half or two hours, with Ms. LaMacchia, and we found that there were two unpaid bills, I believe, that you had not been provided yet, because they'd been submitted but not paid, so those are included in the -- within the package which I brought this morning. I printed those out from my computer for you.

Q. Thank you.

A. That's about it. I mean, I don't know the -- exactly which articles I reviewed, because I started preparing for the deposition about a month ago, because I actually thought it was going to occur earlier, potentially, and I'm going through some changes. I'm

moving, and my office is half-packed up, so I've been starting to prepare for things a little earlier than I typically would, which might just be the week before.

Q. And how many times did you meet with counsel?

A. I had two meetings. One back April -- gosh, right before I filed the amended report, so maybe April 12th, 13th, whatever -- if it's -- not a weekday. I'm not sure of the exact date, and then I had a phone call yesterday. It wasn't an in-person meeting; just a phone call yesterday with Ms. LaMacchia.

Q. And how long did each meeting last?

A. The meeting back in April was probably two or three hours, and the meeting yesterday was two hours, I believe.

Q. Okay. And was anyone else present during these meetings?

A. Mr. Miceli, an attorney involved in the case, that I have worked with on this case, was also involved in the meeting in April, and yesterday, he joined the call for maybe fifteen, twenty minutes. He wasn't on the entire time, but he was on the call for a period of time yesterday.

Q. And did you review any documents with counsel during these meetings?

A. During the first meeting, yes. The first

meeting, we went through my report because I had noticed that there were some corrections, or typographical errors and things I wanted to make sure you were aware of, so that's one of the things we did. We went through that. We went through a few of the -- of the papers that I cite in my report. I don't remember all the ones we went through from April. Mainly, we were going through the substance of the report, rather than documents.

Yesterday, we -- I actually brought up and discussed the EPA 1986 guidance with Ms. LaMacchia, because I thought that was something that I -- I just wanted to make sure they understood why I had used it. I describe it in my report; and we pulled out -- we might have pulled out the Bove studies yesterday, or I might have pulled them out while we were talking, just to go through, again, to make sure that if we're talking -- you know, there's three mortality studies, there's a cancer incident study, you know, to make sure we had those all aligned.

Q. And who selected the documents to review?

A. Well, yesterday, I did, and initially -- I don't believe they put any documents in front of me in April. I think we just went through the report.

Q. And did you take any notes during these

meetings?

A. The only notes I was took during the meeting back in April. I actually wrote down on a hard copy of my report the changes that I needed to make. I pointed out to them, here's the typo, here's the correction, I'm going to make this, and then I went back to my office, made those, and I have a date of April 17th. That's the actual day I actually made the corrections and submitted the report to Ms. LaMacchia for the submission to you.

(Exhibit 1 was marked.)

Q. I'm introducing your report as Exhibit 1. If I could have you turn to your CV; forgive me for not saying a page number, but I assumed you knew where it was.

A. It's Appendix A, I believe.

Q. Thank you. All right, and do you recognize this -- the Appendix A of your amended expert report as your CV?

A. Yes.

Q. And is this your current CV?

A. Yes.

Q. And is this a -- is this document a complete representation of your educational and professional background?

A. Yes, I believe it is, though it doesn't have details, for example, on many of the projects I've worked on because I'm not allowed to do that with confidential information, but it has a listing of all of my peer-reviewed publications, publicly-available publications or presentations that I've made, as well as it has a description of what I call my training and qualifications and professional experience.

Q. Is there any new information in your education and experience, publications, since you drafted this document?

A. No, nothing new since then.

Q. And you do not currently hold any certifications in the field of epidemiology, correct?

A. No, I do not.

Q. You have a bachelor of science in zoology, correct?

A. I do.

Q. From University of Georgia?

A. Yes.

Q. And you have a Ph.D. in pharmacology, correct?

A. Yes.

Q. Also from University of Georgia?

A. Yes.

Q. And you hold yourself out to be a toxicologist,

correct?

A. Don't hold myself out; I'm board certified in toxicology, as well, and, also, my dissertation project at the University of Georgia was a toxicology endpoint within -- based upon a drug, a drug action, so toxicology's been a part of what I've done since my very early days in my training.

Q. You partially answered the question, but I wanted to get -- possibly expounding on what's the basis of your expertise in toxicology.

A. Sure, so from the day that I entered the pharmacology department in 1980, the department had both toxicologists and pharmacologists, so people that had same basic training, but they focused on research projects looking at adverse effects or changes within cells and tissues that had to do with either higher-dose exposures or were -- or were indicative of frank toxicity to a cell or a tissue in an animal, and then from there, I actually -- my dissertation project had to do with the cardiotoxicity of digitalis glycosides and understanding the mechanism of action, how the brain triggered arrhythmias, which would have been -- the toxicity was that the heart would actually stop. You would go into ventricular fibrillation, which was the toxicity issue that we were studying.

From there, I went to the University of Arkansas for Medical Sciences, and I actually had an appointment both -- separate appointments to the department of toxicology, as well as the department of pharmacology, so I taught undergraduate and graduate -- well, undergraduate -- not really undergraduate students, graduate students and medical students in those areas, so the basic toxicology course for the students, the grad and the -- students. The medical students didn't take basic toxicology, but the grad students did. And then, in addition to that, while I was working both in my -- in my job there at the University of Arkansas and as I had done in my post-doc between 1984 and '86 at the National Institutes of General Medical Sciences, where I was a PRAT fellow, I was interested in looking at mechanisms that were triggered that related to not just what you would like, for example, a drug exposure or a chemical exposure to do, but what would happen if you would get an aberrant cell response -- too much of something occurring -- so that you would get an undesired effect of a drug or a chemical. And that continued through my years in what I call research, both at my post-doc and my academic appointments at the University of Arkansas for Medical Sciences.

Then I switched career paths when I moved back to

D.C. in 1989, and I worked for a consulting company called ENVIRON, and, there, many of the projects that we worked on had to do with a toxicology focus as they related to risk assessment, looking at the human health effects or the environmental -- adverse environmental effects that may be caused by exposure to a chemical in the everyday environment or through different kind products that people would be exposed to.

I sat for the certification exam in toxicology, the DABT certification in 1993, and I've been continually certified since then. I have to re-certify every five years, and so I've continued to keep that certification active.

Much of my work that I do relates to toxicology, as well as pharmacology. To me, they're related disciplines in a lot of ways, particularly if you're talking about understanding the entire spectrum of the way that a chemical, a substance, can affect the human body, from the first low-level dose exposure up through the higher-dose exposure.

Q. Thank you. You mentioned your publications. Do you have any publications on PCE and bladder cancer experiments?

A. No, I do not.

Q. Have you published on vinyl chloride?

A. No, I have not specifically on vinyl chloride. I've studied both of those chemicals and worked on projects starting back in the early '90s on the toxicity and adverse human health effects, but they were not things that we would publish because we worked on behalf of a client.

Q. And you've never published on benzene, correct?

A. That's correct; the same answer. I've worked on it since the 1990s, but on projects where they would not lead to publications because of the confidential nature of the work.

Q. And the same is true of DCE?

A. PCE?

Q. Yes. Thank you.

A. Yeah, it's true of all four. I haven't published specifically on those, although I have published where the work that I was doing was related to -- somewhat to those chemicals. For example, when I published -- I have a peer-reviewed publication that talks about putting together a strategy for looking at reproductive and developmental toxicity testing, and those chemicals were part of the realm of chemicals that -- in terms of solvents, that we were considering when we were putting together that framework.

Q. Thank you. If, in your report, you'll turn to

the first page of your report, the first two pages, specifically paragraphs 1 through 8, discussing your training and qualifications.

Does any of the experience that you laid out in paragraphs 1 through 8 of your report include experience on bladder cancer?

A. So you'll need to be more specific. Can you -- I don't want to just answer broadly. I mean, broadly, yes, bladder cancer is something I've researched before as part of my work at ENVIRON, but do you want to maybe ask something more specific about it?

Q. Yes. Understanding you can't disclose, obviously, ongoing projects, but have you worked with any outcomes or research regarding bladder cancer when you discuss your training and qualifications, specifically with ENVIRON and your experience through that; so in paragraphs 6, 7, and 8, you talk about working for ENVIRON, and without any, of course, confidentiality of that, if there's any bladder-cancer-related projects.

A. So -- yes, bladder cancer was an endpoint. Cancer, generally, was an endpoint, and different types of cancer, including bladder cancer, were ones that were part of the assessments -- general toxicity assessments I've done in the past at ENVIRON, and also

more recently in projects that I've worked on when I've been with the companies that I have started post-ENVIRON.

Q. So it's fair to say that the research has involved bladder cancer as an endpoint; is that correct?

A. Yes. In other words, with all four of these chemicals, over the last thirty years, I have been asked at different times to look at the human health hazards posed by those chemicals, and cancer, generally, including bladder cancer, would have come up in the work that I did over -- over that time period, so, for example, I was very familiar already with the IARC reviews for each of these chemicals and the different types of cancer, and bladder cancer is mentioned for PCE, and there's also studies with TCE on bladder cancer, as well, in the IARC reviews, just to give you an example of information I've reviewed in the past.

Q. Were you provided with any documents in connection with this matter, the Camp Lejeune Justice Act litigation?

MS. LaMACCHIA: Objection, form.

A. Are you asking me at specific points in time, or just generally?

Q. Just generally.

A. So I was provided, I already told you, with the deposition testimony of Dr. Goodman. It's a rough draft, only. I haven't seen the final draft, and Dr. Gilbert, I think was also a rough draft that I have seen. When I did my literature searches to start work on this case after I agreed to take the case, before I did -- once I did my literature searches and identified articles for retrieval, I did check with attorneys to see if they had some of them already, to try to save some costs for retrieval. They were not free. Not everything was free, so there are some of the epidemiology studies that dealt with bladder cancer, for example, that I know that the -- that the attorneys had collected, so if it was one that needed to be retrieved for cost, I asked first before I retrieved that, so they would have provided me with copies of things that I had identified or wanted to look at.

They -- I think, initially, when I first spoke with them, they might have provided me with a copy of the 2017 ATSDR Screening Assessment for the chemicals at Camp Lejeune, although I pulled all of that down on my own, as well, because I went to the ATSDR website and got anything that was there; supporting documents, as well. That's probably all that I can say right now. We

had conversations --

MS. LaMACCHIA: Please don't reveal anything that we talked about in our conversations.

A. Okay. All right, then I'll stop there.

Q. Are there any documents that you reviewed, but decided not to rely on?

A. So what do you mean "not rely on"? Do you --

Q. So let me ask that another way. Out of the documents you were provided, on which documents did you rely in forming your opinions?

A. So anything in Appendix C are ones that I reviewed and considered, and they are part of what I call my reliance list. Certainly, within my report, I cite to a smaller subset, and so for the purposes of any one statement in my report, those would be specific reliance materials, but I think you'll notice many times I'll use "e.g." for "for example", to show you there that there's many other ones my list that could be listed there, particularly when you talk about things like the toxicokinetics of the chemicals. There's many review articles, and so there's more in my list in Appendix C, likely, than I cite specifically in any one sentence, but I would point you to Appendix C as the information that I have reviewed and relied upon in terms of my weight of the evidence evaluation.

Q. Regarding the methodology section of your report, how did you come up with your search terms?

A. Based upon the scope of work, number one, I was asked to look at the human health hazards posed by exposure to the four chemicals -- PCE, TCE, benzene, and vinyl chloride -- and to focus in particular on the endpoint of cancer, and then bladder cancer specifically within the general disease category of cancer, so, as a result of that, based upon -- as I would typically do in any project, I start with the chemical names as a search term. I linked that with "cancer", and then I linked it further with "bladder", and that's the initial searches that I did.

In addition to that, I was asked to speak to the underlying mode of action. Under my section of my report about biologic plausibility, I talk about mode of action of chemicals, that -- why it makes sense that these chemicals could cause bladder cancer. That's kind of the question I was trying to answer, and so there, the search terms might not have included, initially, the individual chemical, but would have been "bladder" -- "bladder cancer", "urothelial" as the specific subtype, and then looking at either the word "mode of action" or "mechanism", and so that was a separate search that I did because I wanted to understand generally -- and I

have a section on that, the coherence of the disease process, the biology behind what we know about bladder cancer, specifically urothelial-cell bladder cancer.

So those were the searches I did, and then once I did those searches, I retrieved articles, and then, as I typically will do, those articles will lead to reference lists that I might then look at, and there may be articles that were missed in my search, so I always use the reference list at the back of any article that I found relevant as another source of information for articles that may be informative to include within my weight of the evidence.

Then the other part of the process here, because there are so many consensus reviews on each of these chemicals, I also used the reference lists within IARC, EPA documents, ATSDR documents, to cross-reference with the things that I had identified in my search. You know, were there any other epidemiological studies that dealt with bladder cancer and any of these chemicals? Were there any other key papers on bladder carcinogenesis or PCE, or bladder carcinogenesis and TCE that came from those consensus reviews, as well, so I pulled that -- and I thought I had laid it out for you, but I'm just repeating, I think, what's here in my report.

Q. And could you point me where in your report you do provide the search terms?

A. So I don't give you the specific search terms. I typically do that in deposition. That's why I'm answering the question here today for you. I told you where I went, though. I used three different databases. I used PubMed, TOXLINE and DIALOG.

Q. And could another toxicologist replicate your search for literature? Your literature review?

A. They should be able to, if you start with the name of the chemical and add "and cancer" and "bladder", to start with and then, from there, you could also replicate the other search I described, which was the one related to bladder cancer and the term either "mode of action" or "mechanism." You could also limit the search if you wanted to, and I think I did do that after -- when I did the name of the chemical, "bladder", "and cancer", I also would have added "human", because I wanted to focus on making sure I had all the epi studies, so I did that, as well. Sort of a subsearch within that.

They're really large searches, though, I will tell you. There's a lot known, so I always sort by most recent. I start with what's new, because the consensus reviews will often provide a lot of historical citations

for you if you go to there, so if I want to know -- well, and I already know this because I've studied them before. If I wanted to know what was known about TCE and cancer in the 1950s, for example, you can get that from the ATSDR tox profile, or you can get that from the IARC review, or you can get that from the EPA comprehensive human health risk assessment documents, so I did an attempt to go pull those articles.

Q. And what search engines did you use for your review?

A. PubMed, TOXLINE and DIALOG.

Q. And did you include any other search engines in your review?

A. Those are the three I use. DIALOG is a subscription service that I have, so it's not free. What I find it's useful for is getting to more obscure references, especially older, historical references that may not have made it onto PubMed, which has much more of a medical focus, so if I'm interested in something about chemistry or environmental chemistry, DIALOG is very helpful. That wasn't a focus of the work here, so I used DIALOG only as a check to make sure there wasn't some more obscure discussion of the epidemiology of bladder cancer for each of the chemicals, and I didn't find any additional citations that had not turned up on

PubMed or TOXLINE, or were not already cited within one of the consensus reviews.

Q. I believe you touched on this, but did you review the entirety of the literature that was the result of your search?

MS. LaMACCHIA: Objection, form.

A. I looked at the -- the titles, and the abstracts if they were available, in order to choose articles to -- to -- to request. For example, if I didn't already have them. Many of the ones that I found, again, were discussed within consensus review documents or were ones I had already read many years ago, because much of the literature, particularly in the epidemiology of, for example, TCE and PCE are studies that were published in the '80s, '90s, and early 2000s, things that I had read and reviewed before, so I did not ask for every paper and read every paper in their entirety. I focused my review based upon the scope of work that I was asked to address.

Q. Did you exclude studies from your review?

A. So I don't know what you mean by "exclude." I excluded them if they weren't relevant based on title and abstract. Is that what you mean?

Q. Yes. Thank you. Did you consider studies that were inconsistent with your opinions?

A. So I could ask you to define "inconsistent", but since I think I understand what you're asking me, because I get asked this question a lot, I looked at evidence that teaches both ways. In other words, I don't just look for studies that show the relationship, for example, between TCE and bladder cancer. I looked at all of the studies that address that, so there's epidemiology studies, for example, that have -- some of which have statistically significant associations, some of which do not, and also some that didn't even bother to report it, so I look across everything that I can find that's relevant to answering a question, and so, yes, if, by "inconsistent", you mean studies that may not have statistically significant results, but I don't -- otherwise, I don't know what you mean by "inconsistent." That's how I would define it.

Q. That is a perfect definition. Thank you.

You mentioned the scope of your work, so I want to turn to your amended report, paragraph 9, and in here, you describe the scope of your report as being asked to evaluate the human health effects associated with exposure to the four chemicals PCE, TCE, benzene, and vinyl chloride, that were detected at varying levels over the years in the water supply at Camp Lejeune, and to provide opinions as to whether the chemicals that

contaminated the water posed a hazard to human health. You state that as the scope, but then you go on to talk about the focus. Could you define why the focus is included in your scope of work?

A. So, because if I was to write a report that describes in detail all of the human health hazards posed by those four chemicals, we would have textbooks, and so, as a result, the particular question that I was asked to address, by the attorneys, was to focus on the issues related to the human health hazard of bladder cancer and whether or not -- what my opinions were as it related to the relationship, and whether or not bladder cancer was a human health hazard that is linked with, associated with, or, in my view, more like -- at least as likely or not something that you would -- would describe for this particular exposures, based upon how I know the exposure happened. So, in other words, looking at the water exposure at Camp Lejeune as sort of the kind of overarching umbrella, and then putting that within how people are exposed, (unintelligible) telling me, and then using that to look at the literature and focus on the relationship between that exposure and bladder cancer.

Q. And in analyzing the epidemiological and toxicology literature on association, would you agree

that a literature search is a key step?

A. Yes, well, unless you are someone who has a didactic memory, and has done this before, and you're just repeating something, but yes, absolutely, and I would argue, even if you've done it before, you need to update, and so that's why I always focus my searches to look at what was most recent, since, for example, the last time I visited the issue of cancer with each of these chemicals.

Q. And a search should be crafted to produce positive and negative as a results; is that accurate?

MS. LaMACCHIA: Objection, form.

A. I don't think you can craft that way. I mean, as a scientist, you're putting in search terms that are ambivalent to positive and negative. They're just search terms related to that topic, then when you review the literature, you, as a scientist, must weigh all of the evidence you can find that is relevant to the question you're asking, both positive and negative. If by "positive and negative", you're focusing, for example, as I -- I talked earlier about statistical significance, or -- I will say this: For these four chemicals, I would find it hard to believe you would not find a consensus opinion among all the scientists that I have ever met that these chemicals pose a hazard to

human health in the drinking water. That's a basic understanding, so you start from there.

Q. And turn to paragraph 13 in your amended expert report. You've written -- I'll let you get there.

You've written, "In my literature and document review, I employ another tool and generally accepted methodology known as weight-of-the-evidence assessment", correct?

A. Yes, that's correct, the last sentence to the paragraph, yes.

Q. Thank you. And is this different from a more-likely-than-not opinion?

A. Well, that's two different things. Weight of the evidence is a methodology. More likely than not is an -- could be an opinion that you developed after you used weight of the evidence going through scientific information, so it's two different things.

Q. And a as-likely-as-not opinion would result from your weight-of-the-evidence assessment; is that correct?

MS. LaMACCHIA: Objection, form.

A. So using my weight-of-the-evidence assessment in my conclusions, I have formed the opinion that it's at least as likely as not that, and -- I have my bullets that go through each of the chemicals, and I link those

to bladder cancer and/or cancer, so, yes, the result of my weight-of-the-evidence assessment took me to that.

Q. And is there a standard method for your approach to your Bradford Hill analysis that you could reference?

A. So what do you mean by "standard approach"?

Q. So do you reference the original publication by Sir Bradford Hill in conducting your analysis, or do you refer to a more modern interpretation of Bradford Hill applications?

A. So I do both. So the -- Bradford Hill paper in 1965 sets forth, for the first time, this organized idea of how to look at the association of an exposure with a disease, and he has a set of considerations that he goes through nine of them and he talks about them in detail in terms of what he meant each of those to be -- "he" being Sir Bradford Hill; however, if you go forward in time, I cite to the Rothman text from 1998 in paragraph 15. Dr. Rothman's a well-known, well-published epidemiologist who's written many textbooks, and in this particular textbook, he, indeed, talks about use of Bradford Hill cites to the paper, and talks about those considerations in the exact same way generally; however, he uses different language, obviously, because he's writing a textbook, and he gives

a lot more detail, but, overall, what you read in the Rothman textbook, if you ask me about updated, I guess that's an update of a use, but, to me, there's nothing inconsistent in the Rothman textbook from what you see in Bradford Hill. The difference is the Rothman textbook focuses much more on the fact that, by 1998, we had a much more robust published literature in the area of epidemiology than we had in 1965. Epidemiology existed in '65, but there wasn't as much of a focused research effort in that area as there was 30-some years later.

Q. Did you look at strength of association in your report?

A. So in the context of what?

Q. As a -- as one of the nine Bradford Hills, you addressed coherence, and biological plausibility... am I missing one? Experiment, and analogy. So I guess my question is: There's only four addresses in your -- four Bradford Hill addresses in your report, versus nine?

A. So others in the litigation, it's my understanding, are doing a full Bradford Hill analysis, general cause assessment going through each of those nine considerations. The scope of the work that I was engaged to do and agreed to do was to use my expertise

in toxicology and risk assessment to address parts of the Bradford Hill considerations that were relevant to my specific training, expertise, and things that I do on an everyday basis. I address strength of association every time I look at a study. Anytime I look at a study, I look at whether the results were statistically significant or not, whether or not the studies were properly designed to enable you to come up with a statistically significant finding or not. It's like a power. How well was the study designed? Did it have enough people, enough animals in it to be able to come to a conclusion that you believe you could rule out chance alone? So I certainly always have that in my mind as I'm reviewing literature, but I was not asked -- that was beyond the scope of what I was asked to do. I was not asked to do a full Bradford Hill assessment, so that's why I addressed four of them, but not all nine.

Q. Could you point to where in your report where you say that it's beyond the scope of what you were asked to opine on -- or discuss the nine Bradford Hill versus the four which you did discuss that you say is the scope within your expertise in toxicology and --

A. So, I don't have that exact language as you just quoted to me, but I would say if you look -- 15 and 16, in paragraph 15, at the very end, I say, "As a

toxicologist in this case, I have been asked to address some of the Bradford Hill considerations that might apply to the work I have undertaken." So "some" is not "the whole", and then in the next paragraph, I define for you what four I am going to address, and I say, as part of my work related to understanding biological mechanisms that may underlie carcinogenesis, I evaluated the literature, and these four particular Hill considerations are highly relevant to the data and information that I reviewed, relied upon, analyzed, and formed bases for my opinions.

MS. JOHNSON: Can we take a five-minute break? We've been going about an hour.

VIDEOGRAPHER: Off the record. 10:52. This concludes file 2.

(Short recess was taken.)

VIDEOGRAPHER: Back on the record, 11:05 a.m., beginning of file 3.

BY MS. JOHNSON:

Q. All right, for my next question, we're going to turn to paragraph 25 of your report. Let's see, so you -- in paragraph 25 of your report, you write that PCE has been classified as a probable human carcinogen by IARC, correct?

A. Yes.

Q. And this is different from a more certain designation of human cancer risk, such as IARC's known human carcinogen, correct?

A. It certainly is a different classification, yes, and it's typically chosen based upon IARC's description of both the animal and the human data.

Q. And also referring back to paragraph 25, you write that PCE has been classified as likely to be carcinogenic in humans by all routes of exposure, by EPA 2012, correct?

A. Yes.

Q. And this is different from more certain designations of human cancer risks, such as EPA's carcinogenic in humans, correct?

A. It's a different designation, that's correct. All of these classifications have different levels, and, over time, chemicals can move from one to the other based on new data and information.

Q. And also in paragraph 25 of your report, you write that PCE has been classified as reasonably anticipated to be a human carcinogen by the National Toxicology Program, correct?

A. Yes. I abbreviate it "NTP", but you have it correct. That's the name of the group.

Q. I had to look it up online, so... and this is

different from more certain designations of human cancer risks such as NTP's human carcinogens, correct?

A. It's a different designation, yes. All of these bodies have different levels of evidence and different assessments, and a chemical can go from one to the other based upon information that is available at the time of the review.

Q. Thank you. All right, so we're going to turn to paragraph 35 of your report. In paragraph 35 of your report, you also note that IARC classified TCE as being carcinogenic to humans, correct?

A. Yes, that's correct.

Q. And IARC classified TCE as carcinogenic to humans based on sufficient epidemiological evidence for cancer of the kidney with strong mechanistic support from studies in experimental animals and exposed humans, correct?

A. I don't remember the wording, but that sounds -- I would refer -- we could pull the document out to know the specific wording, but yes, I am aware that they called it generally carcinogenic to humans, and then they focused on some parts of the data that they reviewed; and they do discuss kidney, yes.

Q. And do you recall -- the classification of TCE as carcinogenic to humans was not based on a finding of

sufficient epidemiological evidence for bladder cancer, correct?

MS. LaMACCHIA: Objection, form.

A. So I don't think I would state it quite that way. You want me to explain why? I would -- so, certainly, within the IARC review, they acknowledge and they discuss in detail the fact that there has been findings of bladder cancer in humans, but in terms of their overall conclusions, they focus down on the kidney cancer and the human data as being the strongest signal for human cancer.

Q. And you further state in paragraph 35 of your report that TCE is likely to be -- TCE to be likely carcinogenic in humans by all routes of exposure, correct? That is the last sentence --

A. Well, it's not likely. It's actually as carcinogenic. This is -- all three of those bodies found TCE to be a human carcinogen, and they just state it in different ways.

Q. In the same paragraph 35 for this information, you cite to the US EPA 2011 report; is that correct?

A. Yes, that's correct.

Q. Is that report the Integrated Risk Information System Chemical Assessment Summary, TCE?

A. I have to look. I have a number of EPA

publications. Hold on just a second. No, it's the EPA 2011 toxicological review of trichloroethylene in support of the summary information, so the title was "Toxicological Review."

Q. Do you recall if the 2020 EPA risk evaluation for TCE was included in your reliance files?

A. It should be. I have it at home on my computer. Yes. It's on -- it's in Appendix C here.

Q. Thank you. I see your reference. It's -- third page. We are done with your report for just a moment, so if you want to put that aside, we're going to move on.

(Exhibit 2 was marked.)

Q. I am introducing Exhibit -- I'm one behind. I'm introducing Exhibit 2, which is the 2014 --

A. Probably don't want to mark -- oh, there we go.

Q. As you mentioned previously, you reviewed the 2014 Mortality Study for Marines in Training, correct?

A. Yes, that's correct.

Q. And are you aware that Dr. Bove testified that this study suffered from exposure misclassification issues?

MS. LaMACCHIA: Objection, form. Lack of foundation.

A. Are you asking me about something he stated in

his paper, or are you asking me about something he may have said in some other venue?

Q. This was stated during his deposition, and I was wondering if you were aware of any misclassification issues regarding this study.

A. I didn't -- I'm not aware of that testimony that you're asking me about. I believe he discusses limitations, however, and let me look to see whether he talks about that here. Yes, he talks about it here, so it's also discussed in his paper on page 12 of 14.

Q. And was one of the exposure misclassifications discussed on page 12 of his -- of his study that it was very little information on where Marines were barracked?

A. Yes, but I think it's important to point out that, in his discussion of this, the misclassification is not something that's going to result in overestimation of risk, but, actually, underestimation, and that's an important consideration when you look at this study and the limitations.

Q. And one of the study's conclusions states that the precision of many hazard ratio estimates was low, as indicated by wide confidence intervals; is that correct? And, of course, take your time --

A. There is a sentence that reads as you have just

quoted, yes.

Q. And if I could ask you to turn to Table 4 in the study, which is on page 7 of 14; and you see on Table 4, the third line down, where it says "All cancers", and there is a standard mortality ratio of .85, with a confidence interval of .80 to .90.

A. I see that, yes.

Q. And do you see one -- well, one skipped line down for kidney cancer, the standardized mortality ratio is 1.16 with .84, 1.57 confidence interval?

A. Yes, I see that line.

Q. And do you see one below that for bladder cancer, the far right column says .84 for standardized mortality ratio, and .42 to 1.51 confidence interval?

A. I see that number, yes.

Q. And if you go about four lines down, still on the far right column, for non-Hodgkin's lymphoma, abbreviated as "NHL"?

A. Yes, I see "NHL".

Q. Okay, the standardized mortality ratio is .68, and the confidence interval of .52 and .88; you see that?

A. I see those numbers, yes.

Q. And one more about two lines down, also on the right column, you see .78, and confidence interval of

.60 to .99 for confidence interval?

A. If you're referring to the line that is listed for leukemias, yes, I see those numbers, yes.

Q. Yes. If I could ask you to turn to Table 5, which is on -- which is on page 8, the next page, and I will bring you to Table 5, which is for Camp Lejeune versus Camp Pendleton hazard ratios and 95 percent confidence intervals.

A. I see that, yes. I'm sorry, I didn't know it was a question.

Q. I should have put "correct" at the end. And if I could -- I'm going -- I'm looking at the second bold line, "Disease of primary interest", "Kidney cancer", hazard ratio of 1.35 with the lower -- the LCL of .84 and upper as 2.16. I may not have read that correctly.

A. No, you did. That's correct. Those are the correct numbers on the line for kidney cancer.

Q. And if you'll go one line down for bladder cancer, you see the hazard ratio is .76 with the confidence interval as .34, 1.71?

A. You've read those numbers correctly, as they're there.

Q. And about four lines down, abbreviated as "NHL" for non-Hodgkin's lymphoma, .81 hazard ratio, with a .56 confidence interval to 1.18. Did I read that

correctly?

A. You read that correctly. Yes, you did.

Q. And skip one, one more line down -- excuse me -- yes, I believe I just read NHL. I lost my place. The writing's very small. Okay, now we're looking two lines down. And if you go down to "Leukemias", about two lines down, we have 1.11 for hazard ratio, with confidence interval of .75, 1.62; correct?

A. You read that correctly, yes.

Q. Now if we can turn to Table 7, which is on page 10; and it's the bottom table.

A. Yes, I'm there.

Q. And for bladder cancer, we see no results reported in this table; is that correct?

A. They are not reporting on bladder cancer here. They're focusing on four other disease endpoints.

Q. And there are no results reported for non-Hodgkin's lymphoma, correct?

A. For NHL, they are not reporting. This table is focusing on a different issue than an overall hazard ratio. It's looking at what I call dose response.

Q. And there's no dose response for benzene for leukemia, correct?

A. Well, I don't think you can say that based on this data alone. I would -- I haven't focused on that

part of how many people were in each group. Dose response and the results, and the hazard ratios that you would calculate would be highly influenced by the number of people in each group. If you had many more in the low exposure group, versus not as many in the high exposure group, it may be that your hazard ratio that you calculate is affected by the power of the study to detect what the relationship really is, so I don't think you can say that. I think he reports it as he reports it, and I don't disagree with that. You'll notice he has a statistically significantly increased hazard in the benzene low exposure group, however.

Q. We are done with this, if you'd like to put it aside, and I'm going to be handing you... this will be marked as Exhibit 3.

(Exhibit 3 was marked.)

BY MS. JOHNSON:

Q. All right, what I've handed you is -- just for the record, what I've handed you is the 2014 Civilian Mortality Study, and you reviewed Dr. Bove's 2014 Mortality Study of Civilians, correct?

A. Yes. It's one of the ones I cite and discuss in my report.

Q. And are you aware that Dr. Bove testified that this study suffered from serious limitations and

misclassification bias?

MS. LaMACCHIA: Objection, form.

A. I'm not aware of his testimony, but I think you can find that discussion in his limitations section, as well. Let me look and see. Yes, he has it -- actually, it's the section under "Discussion." He discusses it on page 11 of 13.

Q. And are you aware that one of the limitations was a lack of data on worker water use, and that some did not use the water?

A. Yes, it's discussed, and, just as he says in the other paper, however, he believes that these issues with exposure would bias towards underestimating, rather than overestimating, risk.

Q. And if I could ask you to turn to Table 3 in the exhibit. For the Standardized Mortality Ratios Underlying Cause of Death for Bladder Cancer, the standardized mortality ratio for Camp Lejeune is .53 for bladder cancer, and was .69 for Camp Pendleton; did I read that correctly?

A. You read those numbers correctly, yes.

Q. And if I could ask you to turn to Table 4, and for the Hazard Ratios for Camp Lejeune vs Camp Pendleton, and if I can draw your attention to the third line down for bladder cancer, we have .65 hazard ratio,

.12 to 3.65 for a confidence interval. I believe I stated that correctly; is that correct?

A. I think it's -- yes, you did.

Q. And we're still going to use this, but I want to have you set this a little bit to the side for just a moment, and we're going to go back to your report, paragraph 62, please.

Regarding the 2014 Bove study, much of the discussion in paragraph 62 of your report cover studies about male breast cancer; is that correct?

MS. LaMACCHIA: Objection, form.

A. So no. I discuss -- I go through, here, the different Bove studies. I start with the Marines study in the top of the paragraph, then I describe what the civilian study was, and then later on, yes, I do go into the Ruckart study. Ruckart study was different from the other two Bove studies because it focuses on one specific type of cancer only, and it was a hypothesis-driven evaluation that they were being asked to address, and so that's why they focused that out -- at least my understanding of reading the paper, that's what Ruckart describes.

Q. And why is the Ruckart study important for bladder cancer?

A. It's not. I'm giving -- well, it's important

for cancer hazard generally, but I'm certainly not relying on it as having a signal for bladder cancer, because I didn't focus on that. The reason I'm describing it here is I'm trying to lay out for you what did we know. The topic here in this section is hazards posed by exposure in the water to the mixture of chemicals, and so I'm giving you what we know. We have five different studies to go through, and so I just give them to you so you understand that I have reviewed all of these studies and gone through them and considered them as part of my assessment.

And I would point you to -- I'm sorry, you don't have a question pending, but this is what I'm telling you at the end of paragraph 62. I say that all three of these studies, that's Ruckart included, corroborate cancer-specific chemical hazard assessments, so I'm not citing it specifically just to bladder. I'm talking about what those three studies do.

Q. In your last sentence of paragraph 62, you make a reference to bladder cancer latency, but without the -- but not the results of the Bove studies as regards to bladder cancer; is that correct?

A. So in this sentence, my focus is -- I'm trying to explain what latency is and how important that is to bladder cancer, the epidemiology of bladder cancer. It

is a disease that can take many decades to develop. The literature on smoking corroborates this, where that's one of the most common relationships where it has been described, but, generally, for chemical exposure and bladder cancer, people talk about the latency as being many decades; and that's important in the context of Bove because he himself, if you look at his description, this is a ten-year follow-up. It's not a fifty-year follow-up. There's somewhere else in my report I give you some citations to latency and peer-reviewed papers, and it talks about it being as much as fifty years.

Q. And, previously, we looked at Table 4, the study of Marines and the standard mortality ratio for bladder cancer is -- at CL is .84. Do you recall that?

A. We can look real quick. The Marine study, yes.

Q. Yes. Table 4.

A. Actually, it's Table 5. For bladder cancer, no. It's .76. Is this what you were referring to --

Q. Standard mortality ratio --

A. Oh, no, I was looking at the hazard ratio. Sorry.

Q. That's okay. There's lots of tables floating around.

A. Let's see. .84 was the SMR for Camp Lejeune,

yes; not Camp Pendleton. Yes.

Q. And then Table 5 of the hazard ratio for Camp Lejeune versus Camp Pendleton is .76, correct?

A. That's correct.

Q. All right. I believe you can set these aside. I'm going to give you what will be Exhibit 4, which is the 2017 ATSDR Assessment of Evidence.

(Exhibit 4 was marked.)

MS. LaMACCHIA: Thank you. I needed another copy of this.

MS. JOHNSON: Yes. I loved bringing these on the plane. They were so light.

BY MS. JOHNSON:

Q. And you have reviewed the ATSDR's 2017 assessment of the evidence, correct?

A. Yes, and this is listed, and I think even mentioned in my report.

Q. Are you aware, generally, of how long it takes for an epidemiological study to plan and perform -- how long it takes to plan and perform an epidemiological study?

MS. LaMACCHIA: Objection, form.

A. So I don't perform them, but I am generally aware, based on my review of the literature, if that's what you're asking me, but it's highly dependent on the

type of epidemiological study that you're planning to perform.

Q. Dr. Bove performed ATSDR systematic review of four chemicals and 16 health outcomes at Camp Lejeune in just six weeks. Are you aware of that?

A. So show me where you're pointing to. I don't recall the time period described. What page are you on?

Q. I'm not on a page, I'm sorry. As many pages that are here, it is not on a page. Dr. Bove exposed this during a deposition, and if you're not aware of that, would that -- would a time estimate of six weeks to review four chemicals and 16 health outcomes surprise you?

MS. LaMACCHIA: Objection, form.

A. I don't know. I'd have to see the context of what he describes having actually done, so I can't answer that yes or no.

Q. I believe this actually is in the report, that Dr. Bove was -- he did the ATSDR Assessment of Evidence by himself.

A. So where are you?

Q. I am... take the clip off. Well, forgive me, I am mistaken. That was in his deposition.

Would it surprise you to learn that the ATSDR

assessment of evidence was performed by Dr. Bove alone?

MS. LaMACCHIA: Objection, form.

A. Same answer. I don't know. It would depend on the context of what he described as having performed. If this was all information that he already had in his files, that's a different answer, versus information that he had to go and start from scratch with. I don't know what he did.

Q. Okay. We're going to put that one aside for just a moment -- we are going to come back it, so you don't want to have that go too far. I'm marking what will be Exhibit 5.

(Exhibit 5 was marked.)

BY MS. JOHNSON:

Q. It's the National Research Council report.

MS. LaMACCHIA: Thank you.

BY MS. JOHNSON:

Q. And are you aware of the -- referring to the report I just handed you, are you aware of the National Research Council, who they are?

A. Yes.

Q. Have you ever worked with the National Research Council, which I will abbreviate as "NRC"?

A. So not myself personally, but I have supported scientists within the company at ENVIRON who were

serving on panels. The NRC often puts together different panels to address different issues, and Dr. Rodricks, Dr. Joseph Rodricks at my company, was on several of these kinds of assessments, putting together these kinds of documents over the years.

Q. So you are aware that the National Research Council is a branch of the National Academy of Sciences?

A. That's correct.

Q. And have you relied on studies by the NRC?

A. I sometimes have cited to them in reports, depending upon what I'm doing, yes, that's correct. For example, I often rely upon their documents where they've developed RDAs, recommended dietary allowances as part of the work that the NRC does through the Institute of Medicine and specific panels about food.

Q. And did you review the NRC 2009 report on drinking water at Camp Lejeune?

A. Yes, is this -- I was going to ask you is this the '09 report. This looks like the -- you don't have the date and I'm pretty sure that's what this is, yes, so I have seen this, yes, and I have reviewed it. I hope it's listed. It should be in my Appendix C.

Q. And are you aware that the NRC committee on Camp Lejeune had 13 members, and -- well, excuse me. Are you

aware that the NRC committee on Camp Lejeune had 13 members?

A. I'd have to go and look at the description of the work, so no, I -- I mean, I will tell you that it's in common that they'll have eight to fifteen members, based on the work that I did with Dr. Rodricks. They pick people within different scientific disciplines to cover different aspects of whatever it is that they're reviewing so they may have a -- like in a case like this, they may have a modeling person, they may have a toxicologist, they may have a physician, they may have an engineer, all different people to contribute to the questions that the -- that the committee is looking into.

Q. And if you'll turn to page 237 -- yeah, you'll have to take the clip off where the page numbers are.

A. Yeah, it's crazy.

Q. There, they list the biographical information of the Committee on Contaminated Drinking Water at Camp Lejeune, and the first -- the chair is listed as David Savitz.

A. Yes, I see that, and you're right, there are 13 here, if I count them.

Q. And you are not aware of how many authors -- how many authors there were for the ATSDR 2017 Assessment;

is that correct?

A. I don't think that it's listed there, no, and very different -- I would say to you there's a reason why you list it here, but you wouldn't necessarily -- the ATSDR assessment is a work product of the agency. This is a work product of the committee, and so they're going to list you individual people so you can look at whether or not there's anyone here that you would consider in terms of bias or a -- an investment in terms of what the outcome of the -- so this is a transparency issue. You always put the people on the committee and with their qualifications, and if you look at them, you'll see that there's different types of people.

Q. We're going to go back to the ATSDR assessment of evidence for a moment. On page 13 of the 2017 assessment, there is the summary of evidence, and are you aware or do you know where the ATSDR got the term "equipoise and above" from?

MS. LaMACCHIA: Objection, form.

A. I don't think they tell you in this report, necessarily. I am familiar with them using the term, though, in this report.

Q. I'm actually going to take you back to Exhibit 5, the NRC report, and if I could bring you to page 6,

there'll be a large gray box on the opposite page. Excuse me, the bottom -- at the bottom of page 5 -- towards the bottom, there is a categorization discussed, and the sentence states, "The IOM categorized evidence according to an established scheme accepted by the Department of Veterans Affairs in evaluating risk to veterans of the Vietnam War and Gulf War." Did I read that correctly?

A. I'm sorry, I was at the wrong --

Q. One back. At the bottom of page 5.

A. Oh, here it is, yes. I see that, yes.

Q. And on the next box, it describes categories of evidence of association. Did I reference that correctly?

MS. LaMACCHIA: Objection, form.

A. Yes. This is the one that the IOM used to classify, yes.

Q. I think we're done flipping back and forth for the moment. We're starting back on the 2017 assessment of evidence. Okay, now, going back to the overall summary of evidence for the 2017 assessment.

MS. LaMACCHIA: On page 13?

BY MS. JOHNSON:

Q. Yes, on page 13. What is your understanding of the term "equipoise" in clinical research?

A. So "equipoise" is a term I have seen used in English before in other contexts. I've seen it used in this document. In reading this document, I would define it as meaning that there's -- if you're weighing the evidence like I do in my methodology, and you -- the scale tips one way or the other, equipoise is where there's a fifty-fifty relationship, where it's not tipping one way or the other, but it does meet the "at least as likely as not" standard within this report, and also within my report where I'm describing my conclusions as at least as likely as not.

Q. So you do equate "equipoise and above" as -- with "at least as likely as not"?

A. I would, as a scientist, based on my reading of these documents and -- and my understanding of what the "at least as likely as not" standard means within the Camp Lejeune Act.

Q. Are you aware of the term "equipoise" denoting a lack of scientific consensus?

MS. LaMACCHIA: Objection, form.

A. So you'd have to show me what it is you're referring to, to agree or disagree that there's such a definition. I will tell you that, again, "equipoise" meaning that the scales are here, essentially in that range of fifty-fifty, at least as likely as not.

Obviously, that's not reflecting "the scales tipping", where everyone agrees it's this or everyone disagrees with this, so it depends how you define "consensus", too. I refer to consensus documents in my report, and reviews. What I mean by "consensus reviews" are a panel of experts getting together, laying out their evidence for and against why they chose to make certain assessments or certain -- draw certain conclusions, so consensus isn't always having to do with weighting. It can be just essentially what evidence are people looking at, and what can we agree to that we're going to put on paper, so IARC comes to consensus when they draft their reviews. That doesn't mean that everyone on the committee agreed or everyone disagreed. It is what they all agreed to put into the document; "they" being the panel.

Q. So is there any public -- published guidance on how to apply an equipoise standard?

A. I don't know. I haven't ever looked for it. I can't answer that. I will certainly tell you there's lots of guidance on weight of the evidence and how to, as a scientist, to go through and consider strength in limitations, what -- what evidence you do and don't have, whether or not if you're -- if you're asking a question like I was, looking at water exposure to these

four chemicals, you know, do I have data on oral exposure from animals -- which would be the relevant route. Do I have data in humans that may have been exposed orally? Does it make a difference whether people are only exposed orally? And then other things to consider in a case like this is, do I have evidence -- and I do -- where someone has actually looked at a population of people and looked at whether or not they were reports of cancer or other types of diseases in that population? That would be the overall group of studies, Bove and Ruckart, so those five studies that I cite to.

Q. So can the equipoise standard that you described be -- excuse me. That was a bad question. Let me rephrase that. Can the equipoise standard be used to describe positive associations?

A. I don't know --

MS. LaMACCHIA: Objection, form.

A. I don't know what you mean by "equipoise standard." If you're asking me can the word "equipoise" refer to positive associations? Certainly, those are part of what is within the evidence that's getting you to the point of equipoise. You know, obviously, if you're at that point of equipoise, around that fifty-fifty range, in this case of epidemiology,

you obviously have positive studies. You must also have either negative studies or a lack of statistical significance, potentially. Depends on the epidemiologist. That's not what I did in this case. I did not attempt to go through all of the epidemiological evidence and do a general causation overall assessment. Instead, I used the epidemiological evidence as part of my human health hazard assessment in forming my opinions about whether or not it was at least as likely or not that there was a cancer hazard posed by the chemicals, or the -- or the overall exposure situation in the water.

MS. JOHNSON: Take a five-minute break?

VIDEOGRAPHER: Off the record. Time is 11:53.

(Short recess was taken.)

VIDEOGRAPHER: Back on the record. Time is 12:14 p.m., beginning of file 4.

BY MS. JOHNSON:

Q. I'm going to start by handing you what is --

A. 6.

Q. Thank you. Exhibit 6.

(Exhibit 6 was marked.)

BY MS. JOHNSON:

Q. I think you should recognize this. It's the

Evaluation of Mortality in Marines, 2024. You reviewed Dr. Bove's 2024 mortality study, correct?

A. Yes. I cite this in my report.

Q. Are you aware of whether or not this mortality study conducted an individualized exposure assessment?

A. I believe that none of these studies do that he's done, so I'd have to look to see what it says, but I don't recall that being what he would have done. Let me look. No, he doesn't do it on an individual basis.

Q. I'm going to ask if you could turn to page 7 -- excuse me, page 6, and, unfortunately, the page-numbering is where the staple is, so I apologize for that. Table 2 is when you open on the left side.

Table 2 is the Standardized Mortality Ratios for Marines and Navy personnel at Camp Lejeune; is that correct?

A. That's correct.

Q. And if you'll -- if I could point your attention to the second line, where it has, "All cancer malignancies for Camp Lejeune at .92, confidence interval .89, .95. Did I read that correctly?

A. Well, that's the observed SMR; is that what you're asking me? Yes, with the confidence intervals around that.

Q. Okay. And if I could take your attention to few

lines down to "Urinary/bladder"; and just let me know when you're there.

A. Yeah. I'm there.

Q. Okay. And for Camp Lejeune, the standard mortality ratio of .9 -- excuse me, I have .97 with a confidence interval of .74 to 1.24. Did I read that correctly?

A. Yes, you did.

Q. So the standard mortality ratio for urinary/bladder cancer is equal to .97 at Camp Lejeune; is that correct?

A. Yes, that's correct. This is a terribly-done table, but yes, I agree that's what this is. I think he's missing his "N" column, here. There's numbers before. I think that's the number of observations, but --

Q. That's what I deducted from that --

A. Yeah, this is -- unfortunately, the table looks like it's missing a column, but that's fine, yes, I agree that that is the SMR.

Q. And if I could take your attention to Table 4 -- excuse me, I'm sorry, Table 3 -- I misread -- on the next page; and this is the standard mortality ratio for civilians at Camp Lejeune; is that correct?

A. Yes. Unlike the other papers where he split

them, he put them both into one paper on the two different populations.

Q. And if we look at the second line for all cancers, you have the standard mortality ratio of .93, confidence interval of .87, .99; did I read that correctly?

A. Yes, you read it correctly.

Q. And if you go about, oh, maybe, a dozen lines down, for urinary/bladder, we have the standard mortality ratio of .85 and the confidence interval of .50 to 1.34, correct?

A. You read that correctly, yeah.

Q. So for civilians at Camp Lejeune, the standard mortality ratio is equal to .85, with a confidence interval of .50 to 1.34; is that correct?

A. That's what he's reporting in Table 3, yes.

Q. Thank you.

A. I shouldn't say "he." That's what the author is, because there's more than one author reporting.

Q. And if I could point you to Table 4, which is on page 8, for the second line down on Table 4, "All cancer malignancies", adjusted and unadjusted, 1.06 with a confidence interval 1.02 to 1.11, correct?

A. Yes, which would be, by the way, statistically significant in this table.

Q. And if I could take you down about, oh, roughly fifteen rows to "bladder cancer."

A. Yes.

Q. At 1.02, the confidence interval is .7 to 1.45?

A. You read that correctly, yes.

Q. Thank you. And the hazard ratio comparing Camp Lejeune Marines with Camp Pendleton is 1.02, correct?

A. This isn't Marines. This is -- oh, yes, it is. This is Marines. Yes, that is correct.

Q. We'll put the tiny numbers away for a moment. I'm going to return to the 2017 public health assessment.

Now, concerning the risk values that are present in the ATSDR assessment of evidence, are you aware that the policies and procedures used to develop regulatory risk values are conservative and health-protective, and embody an unquantified margin of safety?

MS. LaMACCHIA: Objection, form.

A. So if you're reading a definition, I don't recall that specific language in here, but I would agree that, often, they're health-protective.

Q. Are you aware that the ATSDR has advised the MRLs are set below levels that might cause adverse health effects in most people, including sensitive populations?

MS. LaMACCHIA: Objection, form.

A. I don't know what they state here, but I would agree, based on my experience and training, that an MRL is set to be protective of majority of the people in the population, so that is how they do it. It is a level that is chosen based on scientific evidence to be one where they would not expect to see an adverse health effect. That doesn't mean it couldn't still occur, but that's what they're hoping to do, is to protect against that.

Q. Are you aware that the EPA has advised that reference values are not predictive values, that they provide no information about risks at higher exposure levels?

MS. LaMACCHIA: Objection, form.

A. I think it depends on what kind of risk value you're talking. Some of them are set to be -- for example, they are risk values set under the program called "ABLES" that are meant to be -- some of them are reflective of higher levels of exposure and some lower levels of exposure based upon the time of exposure, but if you're asking me as a general concept, that's possible, depending on the type of reference value you're talking about.

Q. Are you aware that the public health -- 2017

public health assessment was limited by a lack of water sampling prior to 1982?

MS. LaMACCHIA: Objection, form.

A. So I don't know exactly what the language is, but I would agree that they had water samples that were taken starting in 1982, and then they used water modeling to describe, based upon what kinds of activities had happened on the camp, how to construct what levels would have been back in time, which is not an unusual exercise to do when you lack the data, based upon the fact that you just discovered the problem.

Q. Are you also aware that the public health assessment was limited by uncertainty about when the contamination first occurred in the water supplies? I believe you referenced this in your previous answer.

MS. LaMACCHIA: Objection, form.

A. It would be the same answer. I don't know if I can point to the specific language, but, certainly, they talk about exposure starting in around 1957, so they have evidence to believe that that was when things would have -- the dumping and different things would have had occurred on base. So they had information; they just didn't have quantified drinking water levels at the water treatment plants that they discovered in 1982 when they started doing that sampling. I would --

I would refer you to other experts in the litigation that can discuss this much more fully than I can, but I will tell you this: It's important to understand that that reconstruction of what the contamination would have been back at time is not without a scientific basis, based upon my experience in looking at what they've described. I've seen some documents that described how they went about their modeling.

Q. Are you aware that the public -- the 2017 ATSDR public health assessment was relying on testing of finished water for leaving the treatment plant, rather than the point of exposure, like a faucet or shower, for estimating exposure?

MS. LaMACCHIA: Objection, form.

A. I am aware that it was at the treatment plants, yes, which would be the point of origin. I will tell you, however, that it is possible -- although it is possible, since these are volatile chemicals, that you could lose some. The fact that you have it at the point of origin is a common method to use if you're going to do an exposure risk assessment for what someone would get out of their tap, because of the fact that the pipes are -- unless you have a really weird, leaky, pipe system, the pipes are feeding from the point of origin to the home, and then you turn the tap on and it comes

out.

Q. And are you aware that the Public Health Assessment was also limited by a limited amount of information about site-specific exposure parameters?

MS. LaMACCHIA: Objection, form.

A. I don't know what you mean, generally. That's a really are broad term by saying "specific exposure parameters." You want to give me an example that you want me to consider?

Q. Sure. Possibly -- a possible scenario to consider would be a location on base during a specific year, lack of limited information based on where someone lived on base, for what duration of time.

A. So, on the first example, I would agree that they did not necessarily have -- because I already told you I agree that what they did was point of origin, so the issue would be -- would be that is where the data comes from.

On the second, however, that's the type of information -- I didn't do this, but I would imagine, for individuals involved in the litigation, you could ask questions and get information about where they lived, what they did, those kinds of things, but I did not do that. That's the beyond the scope of what I did. I did not do individual exposure assessments for

plaintiffs in the litigation.

Q. And you can put the ATSDR assessment aside for a moment, and we are going to go back to your report. Let's see. We're going to go to paragraph 15; and in paragraph 15 of your report you write, "As a toxicologist in this case I've been asked to address some of the Hill considerations that might apply to the work I am undertaking", correct?

A. Yes, I stated that, yes.

Q. And if you turn to paragraph 27 of your report, you write, "I also reviewed the body of data and information related to PCE exposure and bladder cancer in humans, since the relationship was a focus of my hazard assessment", correct?

A. Yes, that is correct.

Q. And you reviewed that information, the information that you indicate in paragraph 27?

A. I list for you the information that I have reviewed and relied upon, yes, as part of my weight of the evidence evaluation and the hazard assessment approach.

Q. So based on paragraph 15 and 27, did you perform a Bradford Hill analysis of the PCE information?

A. So I performed an -- a weight of the evidence analysis as part of hazard assessment of the PC --

epidemiological literature. As I state for you later on in this paragraph 27, I say at the bottom of page 16, "Although I assume that others will be addressing these studies as part of a full causation analysis, I reviewed each of these as part of my overall weight of the evidence for bladder cancer as a human health hazard linked to exposure to perchloroethylene." So that's a different analysis than you would do if you were -- as others in this litigation will do, I assume -- I believe that's true. I haven't seen any of the expert reports of the other experts for plaintiffs, but, I assume that's what they're doing.

Q. Did you do a -- did you do a Bradford Hill analysis for the human studies for any of the chemicals for the CL's -- Camp Lejeune's studies?

A. So I can't answer that yes or no. Would you like me to explain why?

Q. Please.

A. I'm assuming that you're -- by the way you're asking that question that you're asking me use of Bradford Hill to do a full causation analysis, and that is not what I did; however, I did use the Bradford Hill considerations as part of my review of any of the information that I looked at, and I think I told you that earlier. So, for example, for each of these

studies I list in paragraph 27, I looked at things such as strength of association that was reported, I looked at whether or not the studies describe strengths and weaknesses to give me an idea of whether or not the information would be considered reliable by most scientists that are reviewing these kinds of studies, as I've done in the past. I looked at whether or not the information contained within the studies met the criteria -- I'm sorry, the consideration of coherence. Did they make sense based on what we know how bladder cancer develops as a disease, right? So I looked at that in terms of the epidemiological information and the Bradford Hill considerations, so I did apply the types of things that Bradford Hill lays out in his 1965 paper in terms of how you would go through and look at epidemiological evidence, but, again, I'm not doing a full causation analysis. I, instead, was addressing certain parts of the Bradford Hill considerations that are within my purview as a toxicologist, human health risk assessor, and someone who is forming opinions about the human health hazards and whether or not they met the standard of at least as likely as not.

Q. Okay, so it's -- is it fair to say you conducted a consideration of Bradford Hill, versus an analysis of Bradford Hill?

A. No. I would say, instead, what I did was, I used the Bradford Hill considerations to guide my analysis of studies that would be relevant to what Bradford Hill describes. So, certainly, Bradford Hill in his paper, and also Rothman in his textbook talks about epidemiology as being part of the information -- human studies as being part of the information that would support the kinds of things that he's describing to understand the relationship between exposure and disease, and so that's what I did. I apply the considerations while I'm doing my analysis, but I'm applying the considerations in terms of a weight of the evidence evaluation for hazard, not answering the question about causation that other experts in this litigation are handling.

Q. Okay. So let's turn to paragraph 88 of your report.

A. Okay.

Q. And about middle of the way through, about midway down -- I'm just going to start reading from there because it is one of those I don't want to cut off where you're saying that there's -- the portion I'm going to read is, "more likely than not involves the steps of formation of reactive metabolites in the liver and in kidneys, excretion of reactive metabolites into

urine where they come into contact with cells that line the urinary system -- urothelial cells; 4, interaction of the reactive and genotoxic metabolites in urothelial cells; and 5, initiation of genotoxic events that can lead to carcinogenicity in the bladder." Did I read that correctly?

MS. LaMACCHIA: Objection, form.

A. You have read -- where you started from, you read correctly, that's correct.

Q. Okay. The process that I -- I just read from, do these events take place in mice and rats? The -- the five items that I read from your report in paragraph 88.

A. So, in order to answer that question, you have to have an understanding of the differences between human mice and rats in terms of their physiology of their bladder and the way they store urine. Do you want me to explain?

Q. Yes, please.

A. So, certainly, within mice and rats, we have -- we have evidence from the scientific literature that there are genotoxic metabolites formed in mice, rats, as well as humans, so there are metabolic studies or toxicokinetic studies that have been shown that the -- there are species similarities in terms of the reactive

metabolites formed, but what is different about rats and mice to humans is this concept of how long the contact within the urothelial system -- the cells of the urothelial lining of the bladder can occur, and that's because, unlike humans, rats and mice can void at will, so they urinate every five to fifteen minutes, so there's no long-term storage of -- even when they're sleeping, they're urinating, unlike humans, where we have habits, due to cleanliness and just development of physiology over time, where we store urine during the nighttime, so -- and, in fact, we also store urine during the day. We have patterns. Unless you have a disease of your bladder where you have an urgency where you can't hold urine, most humans will hold urine for hours at a time in between -- in between going to the bathroom. That doesn't hold for everyone. Again, there are pregnant women, women who have different diseases of their urinary system where their valves are not working properly, but, generally, that's true, and, overnight, most of us hold urine for at least four to five hours. Even if we get up in the middle of the night, most of us are holding urine, and that's what's important to understand. It's the idea that you're giving, in humans, a long, prolonged duration of exposure of the urothelial cells, and this is not something you would be

able to see in animals. So if your question was, can I find, in rats and mice, evidence for the exact same types of changes in urothelial cells that you might see in humans that are developing bladder cancer, you're unlikely to do that because of the mechanism here, which requires the reactive metabolites to be excreted into the urine, and then held for a period of time in order for that biological response to be seen. This is consistent, by the way, with the scientific literature that just talks about smoking. It's -- what I'm coming up with here, by the way, is not novel. It's not Dr. Plunkett's mechanism or mode of action. It is something described within the literature for other types of chemicals that, indeed, result in accumulation of toxicants in the urine of humans.

Q. So the -- I may misstate this, so bear with me. So the metabolites would not accumulate in mice and rats to cause evidence of bladder tumors. Am I stating that scientifically correct?

A. They wouldn't sit there as long, that's exactly right, accumulate to the same level, that's exactly right. That's, to me, the important difference in terms of understanding what the literature on rats and mice say. For example, the literature on rat and mice toxicity shows that, just like humans, that these

chemicals are indeed -- these reactive metabolites are formed in the kidney -- we know that -- of all the species, and we know that we have kidney toxicity, so we know when they get to the kidney, those things can, indeed, be toxic, but what we don't have and what we can't cross-extrapolate to is the importance of the accumulation of those toxic metabolites in the urothelial system, and that's -- as far as the bladder, because that's what's different. The physiology's going to diverge, and so if you look at a long-term study in humans, if you have enough latency to look at bladder -- whether or not a certain exposure is linked to bladder cancer, and you follow people for a long enough period of time to account for latency of the disease, you may not get concordant results in rats and mice, so rats and mice may not show bladder tumors, but, indeed, they show similar toxicokinetics, and they show similar injury due to those reactive metabolites in the urinary system where the kidney has been the organ that's been looked at.

Q. So does it make it biologically plausible for TCE, PCE, benzene, and vinyl chloride causing bladder cancer in humans, and exposed animals don't get bladder tumors?

MS. LaMACCHIA: Form.

A. I wouldn't say it that way. What I'd say was I would not expect the animal bioassays to necessarily show bladder tumors, even though we have evidence for tumors of the bladder in humans exposed to these chemicals; so, in other words, the concordance, or the read-across, or the extrapolation is not necessarily dispositive. Just because you don't see them in rats and mice doesn't mean you can't see them in humans, and that's what I'm saying for you. It's a generally-accepted principle of animal cancer bioassays that the -- what is important is whether or not cancer can be caused and whether or not the cancer is being caused systemically or not, depending on how you're exposing the animals, so, in other words, if you give it orally, do you get tumors? If you give it inhalation, do you get tumors? If you give it dermally, do you get tumors? Do you see cancer? And then in terms of -- the other important thing is look at target organs. What are the target organs in animals? And then when you look at human studies, you look at those target organs, but it doesn't mean that you'll have an exact one-to-one read-across. In fact, that is something that the toxicology community sets out in textbooks. The value of the animal studies is not to be able to predict exactly what organs you'll see cancer in, but

to be able to be predictive of cancer itself, and that's what happens. There are some exceptions to that rule. There are certain types of cancers that, indeed, go from animals to humans, but not all, and just because -- again, just because it doesn't happen doesn't mean it can't happen in humans, and that's what the generally-accepted principle has been. You need to look at the human studies by themselves and then look at the biology and see if you understand why, and that's what I'm attempting to do here in this paragraph. I'm attempting to explain the biology and why it makes sense to me that this particular -- this is my per -- actually, I'm talking to all four here, because they all four share -- or all three share this property. Benzene, TCE, and PCE share the property of forming reactive metabolites on the livers and kidney, being excreted into the urine, being able to interact with urothelial cells by the factor in the urine, and there is human evidence of bladder cancer with those three chemicals, as I lay out in earlier sections of the report.

Q. Will you turn to page 55, paragraph 99? In the first sentence of paragraph 99, you state, "To fulfill the Hill consideration of coherence, I compared what is known about the toxic effects of PCE, TCE, and benzene

generally, and the information discussed in the scientific literature about how bladder cancer develops and what risk factors are known, as well as the basic biology of the human urinary system." Correct?

A. Yes, that's correct. You read that correctly.

Q. And we've, of course, talked about how you considered Bradford Hill, but here, the -- the consistency factor isn't addressed; is that correct?

A. Well, consistency within the Bradford Hill considerations would be a different -- a different consideration that I'm not addressing. I'm addressing coherence. I'm talking about the relationship between the basic biology of the disease and what we know these chemicals can do, and whether or not that basic biology of the disease fits within the pattern that I'm describing. So, for example, latency is an example of basic biology of the disease, which would fit here, right? The basic biology of the disease being related to the production of toxicants that can get into the urine, that's another issue of basic biology of the disease, as well.

Q. So the basic biology would fit in with your criteria, which is separate from consistency as a Bradford Hill -- in Bradford Hill factor?

A. So, consistency is a separate consideration, as

I list in my report, and I'm addressing four of these considerations, and that is not one I'm addressing. Again, it's my understanding that others are doing an entire analysis through each of those nine considerations.

Q. Okay, and the factors that you do address in your -- in your -- the four factors that you do address in your report, your literature search covered things that would be consistent with those four, but not necessarily the other five that were not a part of your report. Do I have that correct?

MS. LaMACCHIA: Objection, form.

A. No, not -- no, I didn't do a search on Bradford Hill, other than I did do a search looking at mode of action, which would be part of biologic plausibility, but also fits with experiment, and also fits with analogy, and also fits with coherence, so these four definitely are things that relate to some of the literature that I brought up in that separate search I did on mode of action for bladder cancer with each of the chemicals; however, other Hill considerations would be -- could be gleaned from the literature that I gathered in my literature search. Again, I didn't do a literature search to only try to fulfill those considerations. I did a general literature search based

upon what I was being asked to do, which was a hazard assessment for bladder cancer, and then determining whether or not, based on that assessment, I could form an opinion about that relationship and whether or not -- and what I concluded, and I give you that at the end of my report.

Q. Okay, going one paragraph up to paragraph 98, you describe cigarette smoking as a risk factor for bladder cancer, correct -- or one of several that you list, but a risk factor for bladder cancer, correct?

A. Yes, that's correct.

Q. And do you know how much of a risk factor cigarettes are for bladder cancer? As in what is the overall -- that is a bad question. Strike that. How significant of a risk factor for bladder cancer smoking would be.

MS. LaMACCHIA: Objection, form.

A. So I don't know if I can answer that I know the results of metaanalyses in terms of the hazard ratios. I don't know that I could give you that, but what I can tell you is that, certainly, bladder cancer and cigarette smoking is a relationship that's been discussed for decades in the literature, and, as a result of that, if you'll look at the epidemiological studies that are -- I relied upon, most of those

consider that as a confounder for discussing on whether or not they correct it, adjust it, or were not able to, so I do believe it is an important risk factor, so if someone is doing a differential diagnosis for a patient or an individual plaintiff in the litigation, certainly, cigarette smoking is something they would gather information on, but that doesn't when you're talking about a standard of at least as likely as. It doesn't matter whether one has a higher risk ratio or not. The point is are both of them understood risk factors or not, or are three or four of them understood risk factors as not, because "at least as likely" does not take into account whether or -- or worry about whether or not one has a risk ratio that's twofold higher than other. They're both possible risk factors that you need to consider when you're doing a specific causation assessment. That's my opinion.

MS. JOHNSON: Actually, right now would be a good time to break for lunch, if everyone's okay with that.

VIDEOGRAPHER: Off the record, 12:55 p.m. This concludes file 4.

(Lunch recess was taken.)

VIDEOGRAPHER: Time is 1:45 p.m. Back on the record, beginning of file five.

BY MS. JOHNSON:

Q. I am marking what is going to be Exhibit 7.

(Exhibit 7 was marked.)

BY MS. JOHNSON:

Q. Dr. Plunkett, I've given you a paper -- I may be mispronouncing it. Aschengrau?

A. Aschengrau, yeah.

Q. As the cancer -- Cancer Risk and TCE in Drinking Water in Massachusetts, and have you seen this paper before?

A. Yes, I have. I thought this was on my list, but if it's not, I've seen it before.

Q. This is a case control study, correct?

A. Yes, that's correct.

Q. And the study has no measured dose data, correct?

A. No. They estimate the dose based upon some modeling/statistical analyses, but they did not have individual data; that is correct.

Q. And the study gives results with and without considering latency, correct?

A. They did, yes.

Q. The latency chosen for bladder cancer was fifteen years, correct?

A. I don't remember the number. Let me --

Q. If you refer to page 287, that should assist you.

A. Yes, that's what they state, yes.

Q. And if you --

A. It's the same latency, by the way, for kidney cancer, as well.

Q. And there's no increased risk for bladder cancer, unless latency was ignored; is that correct?

A. So if you're asking about the abstract, that is a statement they make, yeah. That's correct.

Q. We're done with that one. I'm marking Exhibit 8.

(Exhibit 8 was marked.)

BY MS. JOHNSON:

Q. I apologize. I covered it up with the government exhibit sticker, but it's the Mortality Among Aircraft Manufacturing Workers.

And, referring to Exhibit 8, this was a cohort mortality study, correct?

A. Yes, that's what it was. A retrospective cohort mortality study.

Q. And this study concluded that, among the workers most heavily exposed to TCE in our series, there was no significant excess deaths ascribed to, among other cancers, bladder.

A. So are you reading something --

MS. LaMACCHIA: Wait, let -- I'm sorry. Let her finish her question.

A. I thought you said "correct." Maybe I'm wrong.

Q. I will refer you to page 594 for that information; and that is towards the bottom.

A. So could you repeat the quote?

Q. Sure. The quote was, "Among workers most heavily exposed to TCE in our series, there was no significant excess deaths ascribed to", and among the cancers listed is bladder cancer; is that correct?

MS. LaMACCHIA: Objection, form.

A. You are correct that, in that sentence, bladder is one of the cancers where they state that, yeah.

Q. Okay. And on the same page, the study also found no significant excess cancers of the bladder in connection with PCE exposure, correct?

A. State your question again.

Q. Sure. The study found no significant excess cancer of the bladder in connection with PCE exposure?

A. Okay, so I don't see that quote. They do discuss it in the first paragraph under "PCE." Is that where you are? I assume you're reading --

Q. I'm reading under the PCE section.

A. Right, I'm in this first paragraph, and they're

talking about bladder cancer here, but where are you reading from?

Q. I am reading from the last paragraph, which is -- goes towards the top of the second column on page 494. It's a little block --

A. Yeah, okay. All right, so, based on that, what I see is they have a sentence that says, "As noted, we found no significant excess of leukemia or cancers of the rectum, lung and bladder." That's what you're referring to?

Q. Yes.

A. Yes, that is stated there. I agree they state that.

MS. JOHNSON: This is going to be Exhibit 9, which is the... Halaseh study. I may be mispronouncing this.

(Exhibit 9 was marked.)

A. This is the paper that we read -- that I cited to earlier, yes. Halasseh, or Halaseh, I'm not sure. I haven't met the individual, so I don't know.

Q. I think I'll try and go with "Halaseh" for consistency, and I will ask you, this is a non-systemic literature review; is that correct?

A. Are you trying to say "systematic", not "systemic"?

Q. I mean "systematic."
A. So I don't know if he used systematic review. He doesn't state in that in his methodology, so I can't answer that one way or the other. It's a review paper, and I cite to it because it describes some of the things I was talking about in terms of the most common type of bladder cancer being urothelial cells, and also the issues about chemicals contacting the urothelial cells, and that posing a risk of cancer.
Q. And we previously discussed where you mentioned risk factors in your report. Do you recall?
A. I mention some of them, yes, that's correct.
Q. Okay. Did you consider -- and previously, you stated that -- and please correct me if I'm misstating this, that you considered risk factors of cigarette smoking and tobacco in your report?
A. I list it as a risk factor, and it's something I looked for in some of the literature when I reviewed looking at whether or not in the epi studies, they had talked about risk factors, and whether or not they did any adjustments of their hazard ratios -- for example, as a relative risk based on that -- and a common one I think I stated for you earlier is smoking, which would be exposure to tobacco ingredients, and they don't really know exactly what ingredient or complex of

ingredients is responsible, but they believe it's related to the PAHs.

Q. Okay. I'm going to take you to page 6. It's the -- pretty much the last page before the references, and direct you to the first paragraph, the conclusions, where the paper concludes that tobacco is the primary recognized cause of bladder cancer, accounting for 30 to 40 percent of all cases of urothelial carcinoma, and up to two-thirds of all bladder cancer. Do you agree with that statement on page 6?

A. I haven't formed an opinion that I agree or disagree, but I would state for you I have seen similar suggestions, and that's why most of the papers on epidemiology will look at it in terms of confounders.

Q. And did you consider other risk factors related to occupational exposures, such as aromatic amines?

A. Well, I'm not doing specific causation, so I can't answer that for any individual plaintiff, but, certainly, I discuss the fact that other chemical exposures are also potentially linked; however, in the -- in the water at Camp Lejeune, we have a definition of what they believe has been found and where it came from, so that's why I would not have focused on aromatic means, other than to recognize that, obviously -- you know, PAHs are an aromatic amine, that's in cigarette

smoke, but if somebody worked in an industry, certainly, in a differential diagnosis, I would expect a physician to ask some questions about occupation.

Q. And if I can direct you to page 4, and under the header of "Occupational and environmental exposure", Haleseh states that this type occupational exposure is responsible for five to ten percent of all bladder cancer. Did I read that accurately?

A. You --

Q. It is, I apologize, the fourth sentence down in the Occupational and Environmental Exposure paragraph.

A. So I disagree that he said that it's just aromatic amines. He's focusing on three specific ones, and I believe that those are -- I think I recognize that list. Yes, I've actually seen the Cumberbatch paper before in the past, so I'm aware that there is a hazard ratio calculated there where they talk about those three specific aromatic amines.

(Exhibit 10 was marked.)

BY MS. JOHNSON:

Q. I'm marking, for Exhibit 10... Dr. Plunkett, I've handed you the Moore paper on occupational TCH exposure and carcinoma risk, and this was a case control study, correct?

A. I'll have to look. This is not one I cite to.

I am familiar, however, with this general topic, but I don't think I have cited to this paper, so let me look.

Q. Absolutely.

A. It's a hospital-based case control study, yes.

Q. So, as a hospital-based control study, it would acknowledge that -- it would be acknowledged that it may not represent the general population in each study for region selection bias?

A. I think -- I can't answer that without looking at the paper. I don't know. I mean, just because it's hospital-based depends upon who the people are and where they came from, and if this is -- it looks like this may have been people that were in the hospital because of having renal carcinoma, and so the issue would be whether or not they were representative. I can't answer that; I don't know.

Q. And did this study consider latency when it gave results?

A. I don't know. I've never seen it, so I can't answer that. You want me to look at it a minute, or you want me to go ahead and look for that? I -- up to you.

Q. Why don't you take a couple minutes and look that over, and then I'll check back with you.

A. Can you ask your question again? I don't think I see anything about latency in here, but go ahead and

ask your question again.

Q. Did the study give results without considering latency?

MS. LaMACCHIA: Objection, form.

A. The results that are provided do not discuss latency; however, I can't tell you without knowing more about the study whether -- looking at the records, maybe they did. I don't know. They don't discuss it in the published paper. What they do discuss, however, by the way -- this is a part of my discussion about my individual susceptibility factors for why certain people may be more at risk of bladder cancer, and this is a specific issue about gene variants that have to do with metabolism.

Q. And before we go any further, let me just confirm that we have the right study. If we can go back to your expert report for a moment, and if you could just peruse your materials considered and I just want to double-check that the Moore study is among the materials.

A. So, I don't see it on my list here. This is alphabetical. That's where I looked, but let me look and see if I cited it back here and then didn't put it the Cs. Yes, I'm sorry, it is in my list, and I may be citing this in my section about genetic susceptibility,

so let me look.

Q. I just wanted to double-check and make sure.

A. I apologize.

Q. No, that's fine.

A. No, I didn't remember this one.

Q. And if you'd like to take a couple minutes to refresh on the study, that's fine --

A. No, no, I looked through it and I didn't recall the study, but the topic, I do recall because I talk about this in my report about gene variants, so -- anyway, so go ahead.

Q. Did this study assess environmental exposure to solvents in drinking water or air pollution?

A. No. This was based upon job -- mainly upon job descriptions of exposure -- occupational exposure to -- to more than TCE, but TCE was a focus.

Q. We're done with that. You can put that one aside. I believe you have your report still in front of you --

A. Uh-huh.

Q. Just wanted to double-check. Okay. In the Section C of your report on benzene, do you opine that benzene can cause bladder cancer? And I'm specifically -- I'm specifically looking at paragraph 53.

A. 53?

Q. Yes. It's at the end of the benzene section.
A. So I opine very specifically in my first sentence where I believe it is least as likely than not that benzene can -- the human health hazard of bladder cancer is associated with benzene exposure, so I talk about the fact that the human health hazard could include development of bladder cancer when you talk about exposure to benzene in the water at Camp Lejeune, and I think that's consistent, also, with the conclusion that I have at the end of the report, as well; so it's not quite what you said.
Q. I understand. Let's see. So is it your opinion that benzene in Camp Lejeune water was sufficient by itself to cause bladder cancer?
MS. LaMACCHIA: Objection, form.
A. I don't think I formed that opinion, no. That's beyond the scope of what I did for benzene by itself, but I certainly think that the scientific literature would support my opinion that water contaminated with benzene, whether at Camp Lejeune or anywhere, would be hazardous to human health, and it could include the specific human health hazard of bladder cancer.
Q. As a toxicologist, do you agree with the principle that the dose makes the poison?
MS. LaMACCHIA: Objection, form.

A. So I agree, generally, with that concept, but it's highly dependent upon, not just dose, but also other characteristics of the chemical, as well, but, certainly, that's the general principle that most of us -- it's a starting point for toxicologists when they consider exposure.

Q. So, in general, the risk of developing a disease from a chemical exposure increases with the dose? Have I stated that correctly?

MS. LaMACCHIA: Form.

A. Well, it does for non-cancer human health effects, but for cancer human health effects, it's not quite so clear, and that's because of the fact that, in order to examine cancer risk, we have -- the data that we have doesn't define the threshold for most cancers for most chemicals, so as a result of that, there is a -- for risk assessment purposes, there's linear low-dose extrapolation which is performed, where you assume that there are -- very low levels of exposure can, indeed, cause cancer outside the realm of observed -- observations in animal studies, for example, or human studies. We haven't defined it, and if you haven't defined it in risk assessment, then what you do is, you assume that -- that you go from the dose that you know about down to zero in a straight line. Do I believe

there is some dose that could be at risk without cancer? I believe there probably exist, but we have not defined it for these four chemicals, so, for purposes of human health risk assessment, we operate on using the linear low-dose extrapolation method.

Q. You may have already answered this in your last question, but I want to pose -- what is -- what is the level of exposure to benzene that would be necessary to cause bladder cancer?

MS. LaMACCHIA: Objection, form.

A. So no one has determined that, in an animal study or a human study, to date. Instead, what we know is that, across doses from low exposures for longer periods of time, or higher doses for shorter periods of time, cancer generally is an outcome that you'd see. The most common cancer would be leukemia, but you also have studies that have shown risks of other cancers, as well.

The latency for blood cancers is shorter than bladder cancer, and so that may be a confounding factor for why we haven't been able to find any information on what levels of exposure are more likely or less likely to be associated with an increased risk.

Q. Is it your opinion that exposure to any amount of benzene is sufficient to cause bladder cancer?

MS. LaMACCHIA: Objection, form.

A. I don't think I formed that opinion, no. That's beyond the scope of what I attempted to do, but I do believe that in the literature that I have reviewed and relied upon, that I can draw the conclusion that exposure to the levels of benzene that are reported in the water at Camp Lejeune, and that's why I did that risk assessment for you later on where I tried to quantify what would be the probability that someone exposed to levels of those four chemicals in the water -- and I have levels of benzene that I input into that model -- what that probability may be.

Q. So based on your model, how much Camp Lejeune water exposure is required to reach a level of benzene exposure that can cause bladder cancer?

MS. LaMACCHIA: Objection, form.

A. That's beyond the scope of what I did. The model that I use, it -- you have to put -- input some dose, so it's what was the exposure level based on that. You can use the model or the equations to predict what the likelihood of observing cancer would be; and this is cancer generally. It's not any one particular form of cancer, because it's based upon the calculated cancer potency factors that have been based upon different data sets for chemicals.

Q. Okay, so -- so no specific cancer would be the output of the model; it would be cancer, generally?

A. The model that I'm using, which is the EPA method for -- based upon EPA's equations for modeling or predicting what a risk could be in a population, so not talking any one individual. I'm talking about a population of people exposed to benzene and the other chemicals in the water, but in my table, you could pull out benzene alone, because there's a number for that. Based upon the data that is observed, I'm predicting what would we maybe see? Would we expect to see there be an increased risk above that de minimis risk of one in a million and that's what the model does. The model is not predicting with any certainty that there will definitely be ten people or a hundred people or a thousand people. It's just saying that, based upon the situation and the conditions that you're putting into that "cancer model equation" that is being used, this is what you would look for. Would you see an increased risk? Yes. That's what my calculations say. They say that there should be an increased risk, and so I would expect to see some cases of cancer in the. Population, including cases of bladder cancer, based on my assessment of the relationship between exposure to these chemicals and the human health hazard of bladder cancer.

That's probably more than you asked for. I apologize, but I --

Q. No, no, it's -- trying to parse this out. I appreciate the more fulsome explanation you've provided.

And you provided a -- I can repeat the same question for TCE and bladder cancer; however, you have opined similarly on TCE. I can go through -- if you want to go through the questions similarly as I did for benzene to make it a little bit easier to digest --

A. It would have the -- if you're -- if you're going to ask the questions the exact same way, I would address them the same way, whether it was benzene, vinyl chloride, TCE, or PCE. I haven't formed an opinion one way or the other that there is any specific dose that is the threshold at which you get bladder cancer. The data would not allow us to do that. What I have done in my assessment is form the opinion that it's at least as likely as not that bladder cancer's a hazard associated with exposure to the water at Camp Lejeune containing -- and tracing it to TCE, or tracing it to PCE, or tracing it to benzene and then when you talk about increased risk of cancer, then I'm throwing vinyl chloride back in because I'm not talking about a specific form of cancer. I'm talking about cancer generally and whether I would

expect to see cancer in the population of people exposed to the water at levels that were being detected at Camp Lejeune.

Q. Thank you. I was going through the exact same questions for each individual chemical, so that has been the rest, vinyl chloride. With one follow-up for chloride -- you mentioned vinyl chloride comes back into play because we are not talking about specific bladder cancer. We're talking about cancer generally. Do I understand that correctly?

A. Yes. My opinion about vinyl chloride is it poses a cancer hazard, and the reason I discuss it in this report, even though I'm focussing on bladder cancer, is because of the issue -- the fact that vinyl chloride is something that's actually formed from TCE -- PCE due to metabolism. PCE is metabolized to vinyl chloride and TCE, so, as a result, when you're talking about the exposure to TEC, it's very likely that people in the environment that were exposed to just one were exposed to all three, and then, in addition to that, we have good evidence that vinyl chloride produces toxic metabolites that are reactive that are also formed similarly by liver metabolism, kidney metabolism, by the enzymes that are present, but the data on vinyl chloride are not there for me to be able to form the opinion that

it's least as likely as not that the human health hazard of bladder cancer is associated with vinyl chloride, but cancer is.

Q. And, just to clarify, you have not addressed DCE anywhere in your report. Were you asked to discuss or opine on DCE or just PCE, TCE, vinyl chloride, and benzene?

A. So the four chemicals that I was asked to opine on are the ones you've just listed and if by "DCE", you mean dichloroethylene or ethane?

Q. Ethylene --

A. Yes. No, I was not asked to opine on that. It has its own human health hazard profile, though. I was not asked to do that.

Q. Okay, thank you. And thank you for helping me with the word, because I understand there are two endings to the "E" in DCE. And before we move on to another area, I'll ask for a short break.

VIDEOGRAPHER: Off the record, 2:23. This concludes file five.

(Short recess was taken.)

VIDEOGRAPHER: Back on the record, 2:39 p.m., beginning of file six.

BY MS. JOHNSON:

Q. Referring back to your report, we're going to

transition to the mixture section of your report, and no specific paragraph; just that section generally as a reference.

A. Okay. Yeah, it's after the vinyl chloride. Okay.

Q. Page 56, it starts.

A. Uh-huh.

Q. At least I have 56?

A. Page 56? Oh, you're further than me. I was looking at the hazards posed by the mixture on page 34. Okay, yeah.

Q. You evaluated -- previous to this section, you evaluated the chemicals -- the four chemicals individually; is that correct?

A. Yes, that's correct.

Q. When you were retained, were you initially only evaluating individual chemicals?

A. No. I was always asked to look at the human health hazards exposed to chemicals in the water, and so, to me as a toxicologist, you start with looking at the individual profiles to know whether or not there's any reason to consider there to be potential for additive effects among mixtures. Does that answer your question?

Q. Yes. Did anyone ever suggest you frame your

opinion based on a mixture, rather than the individual chemicals?

A. No, no one suggested how to frame my opinions. I just agreed to a scope of work.

Q. In your chemical mixtures section of your report -- or throughout your report generally, do you reach the opinion that there's a causal relationship between Camp Lejeune water and bladder cancer?

A. That was beyond the scope of what I did. I would consider that as a full -- I'm sorry, a general causation assessment. I do believe, however, you find causal statements similar -- you'll find some reference to statements that could be used if I was going to do a full causation assessment. Do you understand what I'm saying? In other words, some of what I have in here, someone else could take and build upon, and, if asked, you could do a full causation assessment. That was beyond the scope of what I did. I have the building blocks for some parts of that.

Q. I understand that. Thank you. And in going through, in case you'd like to refer, I'm looking at your conclusions for the wording of your first several conclusions generally and the phrase "Camp Lejeune water." For one of the individual -- I'll read one off. "It's at least as likely as not that the exposure to

Camp Lejeune water with PCE specifically is hazardous to human health, and that the human health hazard would include the development of bladder cancer." When you say "Camp Lejeune water", how are you defining that?

A. I'm defining it as the -- as the substance that is described within the ATSDR assessment of what the water was coming from the water treatment plants, and then the fact that there was water detected with certain levels of perchloroethylene over time for this conclusion, so I'm referring to the fact that I'm aware of the fact that Camp Lejeune water treatment plants had water in it that was contaminated with perchloroethylene.

Q. Did you define -- in the chemicals mixture Section 7 of your report, did you define "Camp Lejeune water" differently as in your individual chemical conclusions?

A. No. I don't think so. Are you referring to paragraph 100?

Q. Yes.

A. So Camp Lejeune water, the data that I have indicates that there were four different chemicals found in the water, and in samples, they would be found at the same time, so they were a mixture. And then -- so I think that's the same as what I'm telling you in

my conclusions, but I'm focusing on a particular chemical. I'm saying that, in that water that contained perchloroethylene, it may have also had TCE and benzene and vinyl chloride. We know it had perchloroethylene, and my assessment indicates that the perchloroethylene or the PCE within the Camp Lejeune water that people drank was an exposure that would pose a human health hazard of bladder cancer to anyone who drank the water.

Q. Okay, so the -- so the combination of contaminants would be PCE, TCE, vinyl chloride, and benzene? Did I state that correctly?

A. Well, the water had all four, but for any one individual, for example, on any one given day, it may be that they -- we don't know what -- whether or not they had more PCE or more TCE. We don't have those measurements, so, instead, you take those measurements you have and you look at whether or not they were exposed to -- they were exposed to water where the information supports what mixture was there, okay, and I know that, for example, within the data for Hadnot Point and Tarawa --

Q. We're calling it "Tarawa", but we could be --

A. Tarawa. Tarawa and Hadnot Point, that there might have been a different mixture in terms of what predominated versus the other, but in both cases, they

detected all of those in the water at different points in time. Sometimes a non-detect for vinyl chloride on a given sample, but there are data indicating that all four were there.

Q. And did you account for the differences in mixture levels in -- by area? I'll make that a two-part question. Did you account for differences in mixture levels by area, say, Tarawa Terrace or Hadnot Point?

MS. LaMACCHIA: Objection, form.

A. That was beyond the scope of what I did. It's my understanding there are others who are looking at these issues of differences in exposure, but that was beyond my scope.

Q. And did you account for differences in mixture levels over the years of the -- the years at issue in this case, which would be the 1950s or '60s through 1980s?

MS. LaMACCHIA: Objection, form.

A. I think that was beyond the scope of what I did, as well, although I am aware of the fact that there are data in some tables and certain documents that the ATSDR has that there are differences at different points in time in different years, which is why I am focusing on the issue of hazard, which is the potential. If

they're there, they have the potential.

Q. Are you aware of a cumulative dose that a mixture become -- that the mixture particularly at Camp Lejeune become carcinogenic?

A. I don't think I have tried to determine the entire realm of values, but I do give you -- in my calculation, I give you -- I took the median levels, I believe, and -- not mean. I think I took the median. Maybe I took the mean levels, and I gave you that calculation, so that is a calculation where I gave you individual numbers, and then I gave you an additive number, and that should be Appendix D. It's also a table in my report, as well, but Appendix D, you can get that, as well, so you can see each chemical -- this is on -- I don't think I give it a table number, but in Appendix D, I have a spreadsheet table for you, and I give you each chemical based upon each of the two separate systems, or taking mean values across the system, okay, so I'm looking at different levels and different -- and different reports of data, and I'm giving you a trichloroethylene, for example, estimated oral cancer risk at a certain exposure level, and I'm doing the same thing for perchloroethylene, vinyl chloride, and benzene, and then I'm estimating a cancer risk assuming that, based upon the data, that all four

of them are there, based upon the mean levels that I'm reporting, and I'm doing it based on two different exposure levels, either four liters a day or eight liters a day, and I talk about in my report why I chose these values.

So I think this is an answer to your question. I did do it here, but I'm not saying that there's not other values you could calculate, depending on different exposure scenarios you wanted to use.

Q. Do you know of any scientific literature that has specifically studied the carcinogenic effects of this mixture?

A. Yes, it would be the Bove studies, the Ruckart study; if it's literature. And then, of course, for government documents, it would be the ATSDR assessment. Oh, Rosenfeld. That's the other one. I forgot that one. That's also cited in my report, as well.

Q. And are you aware of any dose response assessments specific to this mixture, rather than the individual chemicals?

A. Are you asking me if anybody has done a study where they've taken water and -- with certain levels of those four chemicals, and then manipulated the water to make the levels higher and lower and given them to an animal? Is that what you're asking me? Because that's

the only way you would be able to do that.

Q. That would be a yes.

A. So if that's what you're asking me, yes, I mean, somebody could attempt to do an animal bioassay. I would tell you that it would be a waste of animals, however, because the answer you would get from an ethical review committee for reducing animal use, they would say we know something about each of those individually, and there would be no need for us to repeat that and look at that based on the epi data we have, and then also the individual data we have. It would be -- it really, truly would be a waste of poor animals at this point, but, hypothetically, could you do it? Yes, you could try to do that.

Q. Did you conduct any dose response modeling for this mixture?

A. I did not. It's described a bit -- I believe in the Bove studies, they talk a little bit about exposure response, but I did not attempt to do that. That was beyond the scope of what I did.

Q. If you were provided with a dose response modeling for this mixture, would it have given your opinion more certainty?

MS. LaMACCHIA: Objection, form.

A. So there, you'll need to describe what you mean

by being provided dose response modeling. Are you talking about toxicokinetic modeling to look at rate of formation of reactive metabolites? Are you talking about an animal study? What are you talking about? Because there's different ways you can do that.

Q. I'll be referring to an animal study.

A. No, I don't believe it would have given me anymore certainty at this point based upon the human data that we have for not only the individual chemicals, but even the studies that have been done by Dr. Bove and his group looking at cancer in the population. The only way to get to more certainty at this point in time would be to continue to monitor those Marines another ten years, another ten years, another ten years, and see, once all of them have died, what the actual estimates of cancer risk were in the population, and that's a study that just is probably not possible to do, based upon how expensive it would be to -- and how much -- how hard it would be to get people to agree to be followed for that long a period of time. That would almost be a clinical study at that point.

Q. Did you examine whether any of the chemicals compete with each other for the same metabolic pathways?

A. I did, and that's why I discussed in my report the importance of the fact that, actually, these were

low-dose exposures, compared to what we know about the saturation levels for the enzymes, where you would start, and that's when competition would become extremely important. If you've got enough of the two chemicals, let's say PCE and TCE, in the blood such that they saturated the enzymes and they are no longer being produced at the same rate, that would be a problem, but the indication from the literature that is available would indicate that that's not something that would be a significant driver, based upon the levels of exposure we're talking about.

Q. So that means it would not be a problem in this particular scenario with these four chemicals in Camp Lejeune water?

MS. LaMACCHIA: Objection, form.

A. I don't think -- I don't know the answer to it. It's not something I can answer based on the available evidence I have, but what I would say to you is that's how you would attempt to do it, is you'd have to almost do studies to figure that out, but, because, as I point out in my report, that we have low-dose exposures and we know the enzymes saturate at higher -- at levels that are considered "high", how do we define that? I haven't attempted to do that, but that's a discussion in the literature, so I don't believe, in the data that we have

on the levels in the water, it's not like I have parts per million of PCE and parts per billion of TCE where I'd worry about the PCE interfering with the TCE metabolism. All of those things that are available are in the same magnitude of exposure in the part per billion range, I believe, from the data I've seen.

Q. The exact relationship between the interactions of TCE, PCE, benzene, and vinyl chloride is not known; is that correct?

A. You'll need to be more specific. Relationships to what? To producing -- producing certain levels of reactive metabolites, to producing genotoxic events, to producing a cancer response? All of those could have different answers.

Q. Okay. My specific question is regarding any synergistic effect.

A. So there's been no studies on the -- and you'll notice I don't opine that they're synergistic. I mention that the mixtures guidance document at EPA says assume they're at least additive, maybe synergistic, but I haven't opined that they are synergistic, which is why, in my mixtures risk assessment, I didn't attempt to add them together at anything greater than simple additivity when I did that calculation for probability of -- or how -- what would my prediction be for the

likelihood of cancer risk based upon the numbers that I input, and, again, it's -- it is a projection based on the numbers I put in, and I haven't done any type of -- and I wouldn't suggest you do any type of plaintiff-specific risk assessments that way. I told you that in my report. I think the best way to look at individual risks is to really look at differential diagnosis through a specific causation assessment, because each person can be so different than the next person, and you would need to consider that in a medical context, not just based on exposure alone.

Q. So you did -- you did opine on an additive effect interaction between the four chemicals at issue that you discuss in your report; is that correct?

A. Yes, because I said that the available guidance from EPA would indicate that that's what you would do if you wanted to do a prediction of risk based upon EPA methods. You would assume additivity, because all four have cancer as an endpoint. Three of them are even more similar -- benzene, PCE, and TCE -- because they have bladder cancer, I believe, as a hazard, so you could take my table and take away the vinyl chloride if you wanted to and just look at those three. You could also look at the potential additivity of just PCE and TCE, or you'd look at all of them individually, but the EPA

guidance indicates that you would, if cancer is the common endpoint that you believe they're operating by a mode of action that could be similar, and I say they are, because they're all producing reactive metabolites that can be genotoxic. That's sort of the basis for my "additivity assumption", that I'm not saying -- I haven't opined beyond that based upon the use of the EPA guidance.

Q. So would you agree that synergy requires empirical scientific evidence, and not just theoretical plausibility?

MS. LaMACCHIA: Objection, form.

A. I haven't formed that opinion one way or the other. What I would say is that I typically would not assume synergy without some scientific evidence upon which to base it on, and that scientific evidence could be due to -- as simple as a -- one study showing that the two chemicals, when they're put into the body, separately or combined, produce a lower threshold for toxicity. There's a lot of animal studies that in the past have tried to do that. They'll take two chemicals that are similar -- chemically similar, in a class, and if they wanted to determine whether or not they're synergistic or additive, you dose an animal with a hundred milligrams and a hundred milligrams and look at

some endpoint of toxicity, and then you put them together and see whether that endpoint of toxicity is lowered by a lot or not, or does it appear to be more like an additive effect. And you'd have to pick an endpoint -- I mean, some people do it based on a very crude measure of calculation of a lethal dose. That's really, really, crude, but you could also do it based on more objective measures and blood -- blood chemistry, or something else, as well.

Q. Have you performed any of this type of research or experiments that would test that hypothesis?

A. For these chemicals, I have not, but there are -- there are a number of people who have explored this issue when they've developed relative potency schemes for things such as dioxins, and I think even PAH compounds, where they've looked at the individual toxicity response, and then looked at what happens when you add them together. I have not done that work, and I certainly have not done that work in this case with these chemicals, and I did not find that work in the published literature, or else I would have presented it to you. If I had found someone that had done that work, I would have presented it to you to show you what is said about synergy versus additivity.

Q. You have responded to my next three questions.

A. I'm not really trying to do that. I'm sorry.

Q. No, it's -- I mean, these are logical questions, so they kind of naturally flow, so thank you for your response. Let's see. Are there any Camp Lejeune or other contaminated water studies that show exposures to benzene, PCE, and TCE together cause higher cancer rates than exposure to each separately?

A. I'm not aware of that. Again, that would have been something relevant to cite, too, if I identified it in the literature.

Q. Has IARC found the combination of benzene, TCE, and PCE in drinking water synergistic or additive?

A. I don't believe they've opined on that, but I haven't looked, to answer that question for you. They typically evaluate individual chemical solvents, rather than mixtures of solvents, but I can't answer that without looking. I don't know.

Q. Are you aware of any other organizations or agencies that may have found a combination of benzene, TCE, and PCE in drinking water synergistic or additive?

A. Don't know if it's possible. For example -- to answer that question, maybe go look at some of the risk assessments that were done at Superfund sites in the past by EPA scientists or consultants to EPA. Again, that was beyond the scope of what I did, and I did not

attempt to see if others had done that. Let me add, it's not in the peer-reviewed literature, so if I was looking, I would be looking for things that you can find through FOIA, through government documents, things like that.

Q. Turning back to your conclusions, in case you want to get it in front of you.

A. Okay.

Q. Going back to some of the language found in your conclusions, specifically the at least as likely as not, were you -- were you instructed to opine on the At Least as Likely as Not standard as found in the Camp Lejeune Justice Act?

MS. LaMACCHIA: Object to form.

A. I wasn't asked to opine on that standard, but what I was -- as I always do when I began to work in litigation cases, I need to understand the context of the standard, the legal standard that I'm looking at. So, for example, if you were in criminal court versus civil court, you have a different legal standard, right? Well, in this case, we have a different standard than may be applied in some other civil actions, for example, so I was aware of it, and so I asked that question, and when I -- when I found out the answer to that question, that does inform, as a scientist, how I go about looking

at the literature. I will tell you that, in the case of all of these four chemicals, you can -- you can -- on the issue of cancer, it's more likely than not. It's not just as least as likely. All four of these chemicals pose a hazard -- a human health hazard of cancer in drinking water, and I think there's consensus documents that tell you that, but when I talk about this case and the particular issue of Camp Lejeune contaminated water, I have used the standard that scientific assessment method that I thought made most sense to do, which would be to look at what is required, I have to be at least as likely as not, so I have used that language here. Other reports that I do for other cases might use a different -- different language, but I do, indeed -- I would argue that that's not an unscientific standard. It's that weighing of the evidence. It's the idea that when you weigh the evidence as a scientist, you're going to find that the -- where do they fall? Are they about the same, are they weighted one way, or are they weighted the other, so this is not a standard that's that far removed, to me, from science, it's just a matter of how I express it in terms to be consistent with what I was asked to do and the scope of my work.

Q. And did you review the complete language of the

statute in drafting your conclusions -- or your conclusions? And I'll save the next question as a follow-up so I don't ask a compound question.

A. So I did not read the entire statute, if that's what you're asking, but we did have a discussion and I asked about the standard, and this was the discussion, and this is where I came down based on that discussion.

Q. Okay. Have you ever interpreted a statute's legal causation or a standard before?

A. I don't think I understand your question, so I probably have not.

Q. In your previous non-legal professional work, have you interpreted a statute's legal causation standard before?

A. Well, there's two different kinds of work I do, so I don't think I cross over, so -- I use the same methods, regardless of what I'm doing. I use weight of the evidence, I use scientific review methods based on my experience and training, general -- kind of general considerations from Bradford Hill, general reliability standards when reviewing scientific studies. That's all the same, regardless of whether it's litigation or non-litigation, but in a litigation context, I definitely would ask questions of the attorney that I'm working with about -- if there's something particular

about this case in order to explain to the judge what it is that I'm finding and translating my science into something that makes sense for someone who's not a scientist to understand, and so that, to me, is what the at least as likely as not language is about, is taking this, you know, weighing of the evidence and putting it into language that tells you we're about here and if it's more likely than not, then I've got greater than fifty percent, right, and lower than fifty percent on one side, so that's sort of how I've actually talked about it with juries before; talked about what is more likely than not meaning. This is the first civil case I've worked on with the at least as likely as not standard. I will say that.

Q. Thank you, Dr. Plunkett. I have no further questions.

MS. LaMACCHIA: I do have a couple questions, can we just take a Cummins?

MS. JOHNSON: Sure.

VIDEOGRAPHER: Off the record, this concludes file 6.

(Short recess was taken.)

VIDEOGRAPHER: Time is 3:16 p.m. Back on the record, beginning of file 7.

EXAMINATION BY MS. LaMACCHIA:

Q. Dr. Plunkett, before we started the deposition, I had handed the United States copies of your invoices, and I want to make sure they get admitted as Exhibit 11 today.

(Exhibit 11 was marked.)

Q. Prior to the deposition, plaintiff's counsel did produce some invoices. There were a couple that were inadvertently produced, and I'd like to just state for the record that CL_EXPERT_PLUNKETT_000000005 to 6 was inadvertently produced, as well as 03 to 04 were inadvertently produced, so I would like to admit as Exhibit 11 a copy of the six pages of invoices that you were provided before the deposition.

MS. JOHNSON: Need a --

MS. LaMACCHIA: Yes, please, and I will do another formal production of these invoices.

BY MS. LaMACCHIA:

Q. In the very beginning -- probably in the first hour of the deposition, I think you were questioned about things you reviewed in preparation for your deposition, and you had used the term "rough drafts" of Gilbert and Goodman. Did you mean rough draft transcripts of depositions or rough draft expert reports?

A. Just transcripts, and, by the way, I did -- I

should correct today. I did not mention I have seen three expert reports from defense, and they should have been in a list that were provided to you. I've seen Goodman, McCabe, and Lipscomb, but not drafts, just final submitted reports.

Q. So you've never seen any rough draft expert reports, correct?

A. No, I have not.

Q. Okay. Towards the end of Ms. Johnson's questioning of you, she was asking questions about dose response assessments for mixtures versus individuals, right?

A. Yes.

Q. Okay. And you had referred her to Appendix D in your report, which also correlates to page 60 paragraph 108 in your report, right?

A. Yes, and there's also a table in the report that may be the next paragraph down on the next page that also corresponds to -- where I lifted some of the summary statistics out of Appendix D.

Q. Okay. Would you agree that the four compounds at issue -- benzene, PCE, TCE, and vinyl chloride, share a similar mode of action?

A. Yes. That's what I state, and that's why I did the additivity assumption.

Q. Okay, and you've explained this in your report, right?

A. Yes, I did.

Q. Okay. But, independently, in your opinion, to a reasonable degree of scientific certainty, a causal relationship exists between PCE and bladder cancer, right?

A. There's a -- there is a relationship that is causal as it relates to the hazard of bladder cancer generally, yes, and that's the same for -- I thought I corrected, when I answered the question, where I said that each of them individually carries that specific hazard of cancer. Three of them carry the specific hazard of bladder cancer. The only one that doesn't, in my opinion, based on the information I reviewed, is vinyl chloride, and that's because I lack the epidemiological evidence that I have for the other three -- the other three compounds.

Q. Okay. And that was going to be my same question for each of the compounds. So it would be your same answer; is that right?

A. Yes, that's correct.

Q. I don't have any further questions.

MS. JOHNSON: No redirect.

VIDEOGRAPHER: Off the record, 3:20.

COURT REPORTER: Do you have a standing order --

MS. LaMACCHIA: We do have a standing order with -- Kristie Martello, I believe, is her name.

COURT REPORTER: Okay.

MS. LaMACCHIA: And the standing order is, you know, unless we need a rough copy -- like it's a requested --

MS. JOHNSON: I'll take a rough.

COURT REPORTER: Okay.

(Deposition was concluded 3:22 p.m.)

IN THE UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF NORTH CAROLINA

IN RE:	:	Case No.:
CAMP LEJEUNE WATER LITIGATION	:	7:23-CV-00897
This Document Relates To:	:	
ALL CASES	:	

REPORTER CERTIFICATION

VIDEO DEPOSITION of LAURA M. PLUNKETT, Ph.D., taken on April 8, 2025;

I, Sarah B. Townsley, CCR, RPR, CSR, hereby certify to the following:

That the witness, LAURA M. PLUNKETT, Ph.D., was duly sworn by me, and that the transcript of the deposition is a true record of the testimony given by the witness;

That examination and signature of the witness to the deposition transcript was reserved by the witness at the time of the deposition;

I further certify that I am neither counsel for, related to, nor employed by any of the parties in the action in which this proceeding was taken, and, further, that I am not financially or otherwise interested in the outcome of this action.

Certified by me on this 22nd day of May, 2025.

_____

Sarah B. Townsley CRR CCR CSR RPR

Certified Realtime Reporter

TX CSR #5746; LA CCR #92016; RPR 814558

ERRATA SHEET

WITNESS: Laura M. Plunkett DEPOSITION DATE: 5/12/25

REPORTED BY: Sarah B. Townsley CRR, CSR, RPR, CCR

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Federal Rules of Civil Procedure

Rule 30

(e) Review By the Witness; Changes.

(1) Review; Statement of Changes. On request by the deponent or a party before the deposition is completed, the deponent must be allowed 30 days after being notified by the officer that the transcript or recording is available in which:

(A) to review the transcript or recording; and

(B) if there are changes in form or substance, to sign a statement listing the changes and the reasons for making them.

(2) Changes Indicated in the Officer's Certificate. The officer must note in the certificate prescribed by Rule 30(f)(1) whether a review was requested and, if so, must attach any changes the deponent makes during the 30-day period.

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Veritext Legal Solutions represents that the foregoing transcript is a true, correct and complete transcript of the colloquies, questions and answers as submitted by the court reporter. Veritext Legal Solutions further represents that the attached exhibits, if any, are true, correct and complete documents as submitted by the court reporter and/or attorneys in relation to this deposition and that the documents were processed in accordance with our litigation support and production standards.

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