Exhibit 159

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

IN RE:	)	
	)	
CAMP LEJEUNE WATER LITIGATION	)	CASE NO. 7:23-cv-00897
_____	)	
	)	
This Document Relates To:	)	
	)	
ALL CASES	)	
	)	

VIDEO-RECORDED ORAL DEPOSITION OF
MICHAEL D. FREEMAN, MD, PHD, MSCFMS, MPH
TUESDAY, JUNE 17, 2025

REPORTED BY:
DEBRA A. DIBBLE, FAPR, RDR, CRR, CRC, Notary Public
JOB NO. 7364522

VIDEO-RECORDED ORAL DEPOSITION OF MICHAEL D. FREEMAN, MD, PHD, MSCFMS, MPH, produced as a witness at the instance of the Defendant and duly sworn, was taken in the above-styled and numbered cause on the above-referenced date, from 9:04 a.m. to 4:27 p.m. PDT, before Debra A. Dibble, CSR, CCR, RDR, CRR, Fellow of the Academy of Professional Reporters, Notary Public, reported by realtime stenographic means at the Gatti Law Offices, 235 Front Street SE, Suite 200, Salem, Oregon.

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VIDEOGRAPHER:

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DISCOVERY LITIGATION SERVICES

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DEPOSITION EXHIBITS

P R O C E E D I N G S

June 17, 2025, 9:04 a.m. PDT

THE VIDEOGRAPHER: We are now on the video record. Today's date is Tuesday, June 17, 2025, and the time is 9:04 a.m.

This is the video-recorded deposition of Dr. Michael Freeman, being taken in the matter regarding Camp Lejeune Water Litigation being held in the United States District Court, Eastern District of North Carolina. Case No. 7:23-cv-00897.

We are located today at Gatti Law Firm, Salem, Oregon 97301.

Appearances will be noted on the stenographic record.

My name is Drew Goodman with Golkow, a Veritext division. The court reporter is Debra Dibble, who will now swear or affirm the witness.

MICHAEL D. FREEMAN, MD, PhD, MScFMS, MPH,
having been duly sworn,
testified as follows:

EXAMINATION

BY MS. SILVERSTEIN:

Q. Hi, Dr. Freeman. I know we introduced ourselves a few moments ago when we both arrived. I am Kailey Silverstein. This is my colleague Elizabeth Platt. We're attorneys with the United States Department of Justice and represent the United States in the Camp Lejeune litigation.

What is your full name?

A. Michael Freeman, middle initial D.

Q. And what is your current business address?

A. I'm sorry, I have to look at my e-mail for it because it's a P.O. Box.

Q. Oh, that's all right.

A. That's where I...

Q. No, that's okay. Is it P.O.

Box 96309?

A. It is.

Q. Great.

And that's here in -- is that in Salem or in Portland?

A. That's in Portland, 96309, Portland something. It's on -- I think it's on the first page of my report.

Q. Okay.

And you've had your deposition taken before, right?

A. I have.

Q. I think you're probably going to be pretty familiar with the deposition process, but I just want to go over a couple, what I call, ground rules to make sure that you and I are both on the same page.

You understand you're under oath, right?

A. I do.

Q. And do you understand that being under oath requires you to tell the truth?

A. Yes, I do.

Q. And you understand that you are

under the penalty of perjury.

A. I do.

Q. And do you understand this is a court proceeding, even though we're not in a courtroom?

A. I do.

Q. The court reporter here is taking down everything that you and I say. There's a couple of things that we can do to try to make her life easier. One of them is, and you've already been doing this, it's answering all of the questions I ask out loud. I know in ordinary conversation, nodding our heads or saying uh-huh is easy and natural. That's hard to get down on a stenographic record. Does that make sense?

A. (Witness nods.) Yes.

Q. I see what you did there.

You and I should also do our best to not interrupt each other. There may be times where you know exactly what question I'm going to ask next. I'll ask that you allow me to answer it anyway -- or, excuse me, allow me to ask the question anyway before you answer and I'll do my best to not

cut off any of your answers.

If I do, please let me know and you can finish what you're saying.

Does that make sense?

THE VIDEOGRAPHER: I'm sorry to interrupt. Can I check your microphone really quick? I think it's rubbing.

A. It does.

BY MS. SILVERSTEIN:

Q. You and I should also try to speak at a reasonable pace. Sometimes I get carried away and start talking quickly, but it can be hard to keep track of what we're saying if we do that. Does that make sense?

A. It does.

Q. Do you understand that you are the only one testifying today?

A. I do.

Q. There may be times during this deposition where I ask a poorly worded question or something that doesn't make sense. Please let me know if I do that or if you don't understand what I'm saying and I will clarify or rephrase my question.

If you answer my question, I'll assume that you understood what I was asking.

Does that make sense?

A. It does.

Q. Great.

You may hear J.J. object during the deposition. Unless he instructs you not to answer, you're free to answer after he -- we note his objection.

Does that make sense?

A. It does.

Q. During the deposition, I try to take a break every hour to an hour and a half. If you need a break before that, just let me know and we can take a break at any time. I'll just ask that if I've already asked a question that you haven't answered, that you go ahead and answer the question before we take a break. Does that make sense?

A. It does.

Q. Do you understand that you're here today in connection with the Camp Lejeune water litigation?

A. I do.

Q. And I understand that you've been retained by the plaintiffs to offer expert opinions in that litigation; is that correct?

A. That you understand that that is the case or that is the case --

Q. Is it correct that you have been retained to offer expert opinions in the Camp Lejeune litigation?

A. Yes.

Q. When were you hired or retained?

A. I'd have to look at my file to be able to tell you that.

Q. I am going to go ahead and hand you Exhibit 1.

(Freeman Deposition Exhibit 1, Invoices, was marked for identification.)

THE VIDEOGRAPHER: I apologize. Can we go off the record real quick?

MS. SILVERSTEIN: Sure.

THE VIDEOGRAPHER: We are off the record at 9:09 a.m.

(Recess taken, 9:09 a.m. to

9:10 a.m. PDT)

THE VIDEOGRAPHER: We are on the record at 9:10 a.m.

BY MS. SILVERSTEIN:

Q. And, Dr. Freeman, I just handed you what is Exhibit 1.

These appear to be invoices in connection with your work on the Camp Lejeune litigation.

Have you seen these documents before?

A. Well, I assume that they came from my file. I'm not sure if I've actually seen them before.

Q. Do you prepare your own invoices?

A. Someone from my office does. I do not personally do that.

Q. Okay. The first page of these invoices is dated November 27th, 2024.

Do you see that?

A. I do.

Q. Before November 2024, did you do any work on the Camp Lejeune water litigation?

A. Yes, I must have, because the invoice represents work that was done prior to that time.

Q. And what do you mean "the invoice represents work done prior to that time"?

A. The invoice describes a certain number of hours during which work was performed, and that means that the work was performed prior to the time that the invoice was submitted.

Q. Was the work performed prior to November 2024?

A. If the invoice was issued at that date, which I assume it was, then yes, that would be correct.

Q. The date is November 27th, 2024, correct?

A. Yes.

Q. Do you know how long the billing period is for invoices?

A. I'm assuming that question refers to how long before that time the work started, is that --

Q. Correct. Do you know how

long -- how many weeks or months this first invoice represents?

A. Not without looking at my file.

Q. And do you know whether you were retained prior to November 1st, 2024?

A. I would assume I must have been, yes.

Q. Do you know if it was prior to September 1st, 2024?

A. That I can't answer, without looking at my file.

Q. So would it be fair to say probably sometime between September 1st and November 1st, 2024?

A. Well, it wouldn't be unfair to say that, but I can't say it wasn't before September 1st as well.

Q. Okay. Were you retained sometime in 2024?

A. I assume that's correct, yes. I'm sure it was during that time frame.

Q. And when is the first time that you remember doing research or literature review or other work for the Camp Lejeune litigation?

A. I can't tell you that I know that off the top of my head.

Q. Okay. There's not a time that you remember whether or not you know for sure it was the first instance? There's no time that you remember doing work?

A. I certainly remember doing work, I just don't remember exactly when that was.

Q. Okay. So you have no idea when you started working on your reports?

A. No, I wouldn't say that.

Q. Okay. So what is your understanding of when you started working on the reports?

A. Well, based on what we discussed before, it's very reasonable it was in 2024, and it was sometime before November of 2024, November 27th of 2024, but the exact time, like whether it was September or October that the work started, that, I couldn't answer without looking at my file.

Q. Have you billed for all of the time that you worked on the Camp Lejeune litigation in 2024?

A. Up until the time that the reports were issued, yes, that is my understanding.

Q. Okay. And -- okay.

So there's a bill here for November 21st, 2024, for $26,000. For six days later, on November 27, 2024. And then about a week later, on December 5th, 2024, and a little over a month later on January 14th, 2025. Do you see those?

A. Yes.

Q. Do you have a practice for how frequently you send bills?

A. I would say in most cases, billing goes out at the completion of the work. So there's not a -- any kind of monthly cycle for billing.

Q. There are two bills here. The one's dated -- two invoices dated November 27th, 2024, and December 5th, 2024.

At the bottom of each of these, they say: Camp Lejeune-Kidney.

Do you see that?

A. Yes.

Q. Are those for different

projects or are they the same work?
A. Different -- can you please clarify what you mean by different projects?
Q. Sure. You said a minute ago that you generally bill at the completion of the work, right?
A. Yes.
Q. And I see one that says: Camp Lejeune-Parkinsons.
Would it be correct to say your understanding is that invoice contains all of the time you spent working on your Parkinson's report?
A. Yes.
Q. And then there are two invoices that both say: Camp Lejeune-Kidney.
Would it be correct to say that to know how many hours you spent on the kidney cancer report, we need to add the two invoices together?
A. Yes.
Q. And then the last invoice says: Camp Lejeune-Bladder research.
Right?
A. Yes.

Q. And you are not offering any opinions related to bladder cancer, correct?
A. Correct.
Q. Do you recall who hired you?
A. I certainly know Mr. Snidow was involved. And his law firm but there may have been other law firms that were involved as well.
Q. Do you remember working with anyone other than Mr. Snidow about being retained or completing any paperwork to on -- for this litigation?
A. I worked with Ms. Shannon, Lori Shannon.
Q. Okay.
A. Those would be, I would say, my two primary contacts.
Q. Okay. For -- did you work with anybody in writing your reports?
A. In my practice?
Q. Yes.
A. Yes, I did.
Q. Who did you work with?
A. Primarily I worked with Dr. Larry Teeter, T-E-E-T-E-R.

Q. Who is Dr. Larry Teeter?
A. He is an epidemiologist who used to work for the CDC.
Q. And what did Mr. Teeter do -- or Dr. Teeter, excuse me, do for your reports?
A. We collaborated on it.
Q. Okay.
A. So he took some parts; I took some parts.
I was responsible for the final product, but some of the writing was initially done by him and then ultimately edited by me and some of the writing was just done by me.
Q. Okay. Was there any particular -- were there any particular topics that Dr. Teeter was responsible for?
A. No. I didn't treat him as a specialist in one area versus another. I think that it was more or less just splitting up the tasks.
Q. Okay.
Aside from Dr. Teeter, did you work with anybody else at your practice to

prepare your reports?
A. No, I don't -- I don't believe I did.
Q. And if we wanted to know which hours on the invoices reflect your work versus Dr. Teeter's work, how would we be able to tell?
A. You won't be able to tell that from the invoices. They don't specify who did what.
Q. Is that something that is kept track of internally?
A. Only between myself and Dr. Teeter.
Q. And you don't provide that information to whoever does the billing with your firm?
A. No.
Q. Before you were retained, had you heard of Camp Lejeune?
A. Yes.
Q. What did you know about Camp Lejeune?
A. Well, I've been retained in -- by multiple other firms in -- for Camp

Lejeune litigation. And so I familiarized myself with the circumstances of Camp Lejeune during that time.

Q. Who else have you been retained by in connection with the Camp Lejeune litigation?

MR. SNIDOW: And, Dr. Freeman, just -- you obviously know better than I do, but I do want to caution you to protect any privilege with other attorneys.

THE WITNESS: Understood.

A. I don't recall, frankly. It's been over the past couple of years. And so I -- I know we've been retained and some materials have been sent, but I couldn't tell you which firms they were that retained me.

And just to elaborate, I think there's maybe three other firms, or three other cases in which I've been retained approximately.

BY MS. SILVERSTEIN:

Q. Okay. Approximately how many years have you been retained by a firm related to the Camp Lejeune litigation?

A. I wouldn't think it would be much more than two years.

Q. Okay.

Prior to being retained by that first law firm, had you heard about Camp Lejeune?

A. I believe I had.

Q. And do you recall what you knew about Camp Lejeune prior to being retained by any law firm?

A. I think I heard about the congressional action.

It just came up in a news feed.

Q. And between when you were retained by that first law firm and when you started working on your kidney cancer and Parkinson's disease reports for this litigation, what did you know about Camp Lejeune?

A. I would have to just surmise what my knowledge was. I couldn't give you -- I didn't have a great deal of specific knowledge about it other than that it was considered a toxic site, and that there was congressional action associated with it, and

that it was a military site.

Q. Okay.

You submitted two expert reports in this case, one for kidney cancer and one for Parkinson's disease, right?

A. Yes.

Q. How did you determine which diseases to submit reports about?

A. They were the two topics that reports were requested for.

Q. Okay.

A. Or I should say, analysis of reports.

Q. Okay. So you were asked to write reports specifically about kidney cancer and Parkinson's; is that fair?

A. Yes.

Q. What did you do to prepare for your deposition today?

A. I reviewed my reports. I reviewed some of the underlying literature. I chatted with Mr. Snidow. That's pretty much it.

Q. Okay.

You said you reviewed some of

the underlying literature, right?
A. Yes.
Q. What literature do you recall reviewing?
A. Primarily the studies underlying some of the meta-analyses for the TCE estimates. Because that was the largest body of literature that I described particularly for the kidney cancer.
Q. Are there any specific studies that you recall reviewing?
A. No. There's so darn many of them, that -- I can't separate them out in my mind just offhand.
Q. Okay. And you said that you met with Mr. Snidow, correct?
A. Yes.
Q. How many times did you meet with him?
A. Four.
Q. About what time frame did these meetings take place?
A. Three were Zoom meetings over the past couple of weeks.
Q. Okay.

A. And then one was when I met him today.

Q. Okay. For the Zoom meetings, was anybody on the Zoom except for you and Mr. Snidow?

A. I believe Ms. Shannon was there.

Q. And Ms. Shannon is with the same law firm as Mr. Snidow; is that right? Is that your understanding?

A. It is.

Q. And about how long were the Zoom meetings?

A. I think they were each about an hour.

Q. And you said you met with Mr. Snidow in person, right?

A. Yes. You were here for that.

Q. Okay. So you mean when you came into the law firm this morning for the deposition?

A. Yes.

Q. Did you meet with him in person before this morning?

A. I did not.

Q. And aside from your reports and the underlying studies that we discussed earlier, have you reviewed any documents to prepare for your deposition?

A. Offhand, not that I can think of, no.

Q. Okay. And you've been deposed before, right?

A. Yeah.

Q. About how many times?

A. Too many. Is that a reasonable answer?

I believe the count is over 1400.

Q. And about, you know, how long ago was the first one of those?

A. Late '90s.

Q. So in the past 25 to 30 years, you've been deposed about 1400 times. Is that -- does that sound right?

A. -ish, yes.

Q. Have all of those -- about how many of those 1400 depositions have been related to expert witness work?

A. All of them.

Q. Have you ever been deposed in your personal capacity?
A. Yeah, I think we had, like, a business litigation thing some years ago.
Q. Okay.
A. It was unrelated to anything.
Q. And that was just something to do with a business issue?
A. Disputed value.
Q. Have you ever been deposed as a treating physician?
A. No.
Oh, maybe.
No, I don't think I have, actually.
Q. Okay.
And you've testified in trial, correct?
A. Yes.
Q. About how many times have you testified in trial?
A. I would estimate between 450 and 500 times. That may be a little bit of an overestimate, because I'm not really clear about the first ten years.

Q. Okay.
A. But more recent years, where I've kept Rule 26(B) disclosures on my testimony, was I could keep track of it that way.
Q. So 450 to 500 is a ballpark?
A. Yes.
Q. Not a precise estimate?
A. Correct.
Q. Understood.
Just as you did there, if you're estimating on something, please let me know. We don't -- I don't want you to speculate or take any wild guesses on things, but just like there, if you're estimating, let me know and we can make sure that that's noted.
A. I understand.
Q. About how many expert reports have you prepared over the course of your career?
A. Thousands.
Q. Okay.
A. I can't give you a very precise estimate, but it would definitely be

thousands.

Q. Do you --

A. Certainly over 2,000. Maybe over 3,000-ish.

Q. Okay. Does it sound right to say like 2500 to 3,000-ish, give or take a little bit?

A. Well, emphasis on the -ish.

Q. Okay. Great.

Is there a specific topic that you focus on as an expert witness?

A. I have a highly varied practice. So I would say the majority of reports that are done out of my practice relate to traffic crash-related injury and death.

Q. Okay.

A. Second after that would be medical negligence.

And then after that would be mass tort, life expectancy and product defect in the civil arena.

Q. Okay.

A. And then about 20% of my work is in the criminal arena. And so those are

typically wrongful death of some kind, manslaughter or --

Q. Okay.

Of your civil cases, that 80%, about 80% that makes up the civil cases, about what percentage of that is mass tort related?

A. Probably between 5 and 10%.

Q. Okay.

A. That may be an underestimate. It may be as high as 15%, actually.

Q. Okay. Somewhere in the ballpark of 5 to 15%? Does that sound right?

A. It really depends on how you define mass tort.

Q. Sure.

A. So I think that's my difficulty.

Q. Okay.

I am handing you Exhibit 2.

(Freeman Deposition Exhibit 2, 12-8-2024 report, RE: Camp Lejeune Water Contamination Litigation: Kidney cancer outcome, was marked for identification.)

BY MS. SILVERSTEIN:

Q. I handed you Exhibit 2. And this is your kidney cancer report, correct?

A. Along with my CV and my Rule 26 testimony list, it looks like it, yes.

Q. Sure. So it's got the attachments to your report included, right?

A. Yes, I assume those were the attachments to the report.

Q. And does this appear to be a fair and accurate copy of your kidney cancer report?

A. Yes. There is only one copy of that.

Q. Okay. And, Dr. Freeman, did you write this entire report?

A. Well, to the extent that I described earlier, I was assisted in much of the research, but all of the report was ultimately written by me.

Q. Okay. And this report -- all of the opinions in this report are your opinions, right?

A. Yes.

Q. Are all of your opinions about

whether TCE, PCE, vinyl chloride, or benzene can cause kidney cancer contained in this report?

A. They are.

Q. Is there anything in this kidney cancer report that you no longer agree with or that needs to be changed?

A. I haven't been through it a few times over the past couple of weeks. I can't think of anything I've come across that stood out as being something I didn't agree with at the present time.

Q. And if there is anything that you notice today during this deposition, that you think needs to be changed or corrected, please just let me know.

A. I most certainly will.

Q. Sitting here today, are there any opinions about kidney cancer that you intend to offer at trial that are not contained in this report?

A. No.

Q. Could you turn to the --

Sure. Go ahead.

A. That was my finger being raised

as I was about to turn the page.

Q. Got it.

Could you turn to your CV, which is one of the attachments?

And are you at your CV?

A. Yes, I am.

Q. Is this a fair and accurate copy of your CV?

A. Well, it was in December of 2024. It's out of date currently.

Q. Okay. What needs to be updated?

A. Stuff.

Let's see. Probably mostly lectures and publications and media appearances, I would say.

Q. Okay. Since December 2024, about how many lectures have you done that would need to be included in this report?

A. 3 or 4, anyway.

Q. Okay. Do you remember the topics of those lectures?

A. Most recently -- yes.

Q. And what are those topics?

A. It's the role of numeracy and

wrongful convictions and exonerations.

Q. Do you remember the topics of any of your other lectures?

A. Not really.

Q. Do you remember if any of the lectures that you've done since December 2024 have been on kidney cancer?

A. No.

Q. Have they been on Parkinson's disease?

A. I'm sorry. You asked me if I remembered. Yes, I do remember, and the answer is none of them have been on kidney cancer. I should be more specific.

Q. Have any of your lectures been on Parkinson's disease?

A. No.

Q. Have any of your lectures been on trichloroethylene?

A. No.

Q. Have any of your lectures been on purple ethylene?

A. No.

Q. Have any of your lectures been on vinyl chloride?

A. No.
Q. Have any of your lectures been on benzene?
A. Oh, on benzene?
Q. Yes.
A. No.
Q. And you said there may have also been some media appearances that may need to be updated?
A. Yes.
Q. About how many media appearances?
A. About a dozen or so.
Q. And do you remember -- well, to the best of your memory, what were those media appearances about?
A. I think that they were all present, and most of them were related to my work for the Attorney General of Maryland on death and custody.
Q. Okay. And aside from the media appearances and lectures, is there -- are there any other categories of information that need to be updated on your CV?
A. Yes. I thought I said

publications, but maybe I omitted that.

Q. I may have forgotten.

And about how many publications have you had since December 2024?

A. 3 or 4, I would estimate.

Q. And to the best of your memory, what are the topics of those publications?

A. Well, a couple were on pituitary and hypothalamic injury and hormonal deficiency and traumatic brain injury. I believe one is on posttraumatic epilepsy. One is on neuropsychiatric aspects of -- onset of forensic neuropsychiatric aspects of juvenile onset of schizophrenia.

One is on peer review in the forensic medical literature.

And the other ones escape me.

Q. And those are all of the publications -- all of those publications that you just described, those are since December of 2024; is that right?

A. Yes, to the best of my --

Q. Roughly that time frame?

A. -- recollection.

Yes.

Q. About what percentage of your work time do you spend in clinical practice?
A. I don't have a clinical practice.
Q. Okay.
A. I'm not a clinical medical doctor.
So that's not -- I don't treat or diagnose live people.
Q. Okay.
A. I work as a medical scientist, in the field of forensic medicine. So 2/3 of my time is devoted to my forensic practice, and then 1/3 of my time is devoted to academia and editorial work.
Q. When you say "forensic practice," what does that mean?
A. That was what we were -- I was describing earlier, about the breakdown of my forensic consulting.
Q. Okay.
A. Which is the breakdown of the types of the cases that I've consulted on, which is about 80% in the civil arena and 20% in the criminal arena.

Q. So when you talk about your forensic work, you're talking about, like, expert consulting type of work, is that right?

A. Yes. That is the -- a good broad category for it.

Q. Okay.

And what is the remainder -- aside from your forensic -- your forensic work, what is the remainder of your work time spent on?

A. It's in academia. I supervise Ph.D. students. In the field of forensic medicine, typically physicians or scientists. And then editorial work, which actually consumes a fair amount of my time as I'm the editor and chief of a forensic medical journal.

Somewhere in there I write papers too. I just don't know where I fit that in.

Q. Sounds very busy.

Would it be fair to say that your areas of expertise are forensic medicine and forensic epidemiology?

A. Yes. Broadly, that's accurate.
Q. And do you distinguish yourself between forensic epidemiologists and epidemiologists?
A. Yes. To the extent that it can be distinguished, or it should be distinguished in a forensic setting, I do.
Q. Do you consider yourself an epidemiologist?
A. I am. I have two, a doctoral degree and master's degree in epidemiology. I've been a professor of epidemiology for about 30 years.
Q. What's the difference between forensic epidemiology and epidemiology?
A. Epidemiology is very prospective in nature in that it's used to explore relationships in populations between exposures in diseases and injuries. And it is essentially the medicine of populations. Everything we know about efficacy of treatments or different kinds of medicines, everything we know about harmful exposures, everything we know about disease and death, all comes from epidemiologic studies. It's

very, very broad.

Forensic epidemiology is the use of that information -- or information that's gleaned from epidemiology, to look retrospectively at an outcome, particularly on issues of cause or causation. And so it has -- there's some unique aspects of forensic epidemiology which take from epidemiology but are applied at a very unique way.

Q. What do you mean "applied in a very unique way"?

A. Well, epidemiology or epidemiologic principles used for investigation is forensic epidemiology, essentially.

It -- the investigation of an outbreak, for example, is done retrospectively, even though -- well, the CDC actually coined the phrase epidemiology in the 1990's. And they specifically coined it to talk about outbreaks, but in that case it was outbreaks that might be associated with bioterrorist attacks. Epidemiology has been used in that fashion to evaluate sporadic

cases of foodborne illness or blood-borne illness by investigational bodies -- investigatory bodies -- investigational -- I'm going to go with investigational bodies from the CDC or from state public health departments. That is a forensic application of epidemiology, because they're looking backwards in time.

And more specifically in civil or criminal litigation, epidemiology or epidemiologic principles is used -- are used to address questions of counterfactual causation, meaning that a question looks not only at what is the chance of getting sick or killed or injured by an exposure, but when applied to an individual, what was the chance of that individual getting sick or killed or injured in the absence of the exposure.

And that's very unique to forensic epidemiology, taking that population-based technique and applying it more to an individual to answer that question.

Q. Are conclusions drawn in forensic epidemiology versus epidemiology, do

they apply the same scientific standards?
A. Yes, to the evidence that's used. The same scientific standard is used. Epidemiologic methods and principles are used to evaluate the strength of evidence. It's how that evidence is then applied to answer a specific -- a causation -- that may be general or specific causation -- in nature.
Q. Would you agree that forensic epidemiology differs somewhat from general epidemiology, and that it has to do with the evaluation of specific facts about a case? To then assess whether the epidemiologic evidence applies or not?
A. Yes.
Q. Okay.
A. That was very well put. I couldn't have put it any better myself.
Q. Have you reviewed any other expert reports in this litigation?
A. If it's listed in my report, then yes, I have.
Q. Okay. You can't recall any that you've reviewed?
A. Offhand, no, because I wasn't

asked to address any other expert reports.
Q. And after finalizing and submitting your kidney cancer and Parkinson's disease reports, did you review any additional expert reports in this litigation?
A. Not that I recall offhand, no.
Q. Okay. Do you consider yourself a toxicologist?
A. No, but I am trained in toxicology. It's part of my master's degree in forensic medicine.
Q. But you don't consider yourself an expert in toxicology?
A. That's a different question. I would be considered an expert in toxicology since my knowledge level is greater than the average layperson.
Q. Okay.
A. By that definition. However, as far as functioning as a professional toxicologist, no, I would not consider myself the equivalent.
Q. Okay. And do you practice toxicology within the sphere of your forensic epidemiology or academic work?

A. If I am asked a question that I can't address, which is based on toxicological principles, I may. I see a lot of cases that involve lab values for drugs, illicit drugs and an associated death.

And so understanding those values and how they relate to potential legality of a drug, for example, is an area that I've written about.

So there is a small part of what I do that's -- that is forensic toxicology, but it's, in the universe of toxicology, it's -- I would say it's quite small.

Q. Okay. Have you ever taught any courses specifically on toxicology?

A. Not solely on toxicology. Toxicology has been a part of some of my teachings, however.

Q. Okay. How has toxicology been a part of some of your teachings?

A. Well, I developed and taught a course in injury and trauma epidemiology for 15 years. Medical school, where I am on faculty in Oregon, in Portland, Oregon Health

& Science University.

Q. Okay.

A. So toxicology is important in understanding risk factors for injury and death.

Q. Okay.

Have you ever been the principal investigator for a toxicology study?

A. No, I -- absolutely not, I would say.

Q. Okay. Understood.

(Freeman Deposition Exhibit 3, 12-6-24 report, RE: Camp Lejeune Water Contamination Litigation: Parkinson's Disease outcome, was marked for identification.)

BY MS. SILVERSTEIN:

Q. I am handing you Exhibit 3.

MR. SNIDOW: You didn't mark the CV separately, right?

MS. SILVERSTEIN: Correct.

MR. SNIDOW: Great.

(Discussion off the record.)

BY MS. SILVERSTEIN:

Q. Dr. Freeman, I handed you Exhibit 3. This is the report that you wrote for Parkinson's disease, correct?

A. Yes.

Q. Are there any changes or corrections that you need to make to this Parkinson's disease report?

A. Yes.

Q. Okay. And what is that?

A. I found an instance in which I referred to Parkinson's disease as kidney cancer.

Q. Okay.

A. I don't remember exactly where it was, but if you -- if you just search for kidney, that's the place where I just -- I don't know what I was thinking about, but kidney cancer got placed in there.

Q. Okay. Aside from the typographical error, switching kidneys for Parkinson's, are there any other corrections that you need to make?

A. I -- not that I recall, no. I think when I was discussing the Goodman (sic)

study, actually. I could probably find it for you again.

Q. Okay.

A. If you want me to.

Q. Is that a change that you need to make?

MR. SNIDOW: He's talking about the typo.

MS. SILVERSTEIN: Oh, the typo, so there's no other changes except the typo?

A. Yeah. Sorry. I was perseverating or ruminating about it. I believe it's in the section about the Goodman study.

The error.

BY MS. SILVERSTEIN:

Q. Does this report contain all of the opinions that you intend to offer at trial about Parkinson's Disease?

A. Yes.

Q. And are all of the opinions in the report your opinions?

A. They are.

Q. Aside from Dr. Teeter, and the

work that he did that we discussed earlier, did anybody help you write this report?

A. No.

Q. And you don't intend to offer any opinions about trans 1,2-DCE related to Parkinson's Disease; is that correct?

A. That's correct.

Q. And you're also not offering any opinions about trans 1,2-DCE and kidney cancer; is that right?

A. That's correct.

Q. The --

A. Well, I guess I should say aside from the diagram that I have that talks about DCE.

Q. But you're not --

A. I'm not offering --

I'm sorry.

Q. You're not offering any opinions about whether or not DCE can cause kidney cancer or Parkinson's Disease; is that correct?

A. That's correct.

Q. If you could turn to page 4 of the Parkinson's report?

A. Yes. I'm there.
Q. And on page 4, you are discussing the relevant background facts pertaining to drinking water contamination at Camp Lejeune; is that right?
A. Yes.
Q. Where did you -- where does that information come from?
MR. SNIDOW: Objection to form.
And, Dr. Freeman, just know that, you know, conversations with counsel are privileged. But if you can answer it, please go ahead.
A. It came from the information that is cited in the report. So the citation on the first page is from citation -- excuse me, the information on the first page is from the citations 1 and 2.
BY MS. SILVERSTEIN:
Q. Okay.
Dr. Freeman, would it be fair to say that you're not a historian?
A. It would be fair to say that.
Q. Okay. And how did you decide what information to include in this relevant

background facts section?
A. By relevance, specific to the title of the section.
Q. How did you determine what was relevant?
A. The way I always determine what's relevant. I use my brain and my eyes to determine which facts are -- seem to be informative. This document is not written just for you, it's also written for me, so that if I'm asked the question, I have everything that I've reviewed encapsulated in my discussion in this report, and all of my thoughts are in this report as well.
Q. Did you consult with Dr. Kyle Longley on this background section?
A. No, I don't know who that is offhand.
Q. And you didn't review Dr. Longley's report?
A. Unless it's in the materials that were reviewed, no.
Q. Do you recall reviewing a report by Dr. Jay Brigham?
A. I'd have to give you the same

answer.

Q. You don't recall -- sitting here right now, you don't recall if you reviewed a report by Dr. Brigham?

A. I don't.

Q. And if you turn to page 9 of your kidney cancer report -- or of the Parkinson's Disease report. I apologize.

A. Trick question. I was ready. I'm there.

Q. And do you see footnote 9 at the bottom?

A. Yes.

Q. Footnote 9 is a citation to the website tftptf.com.

Do you see that?

A. Yes.

Q. How did you come across this website?

A. I can't tell you I can recall. I assume it had to do with a search for information on the topic.

Q. Was this a website that you or Dr. Teeter discovered? Or was it provided to you?

A. Unless it's in the materials that have been provided to me, nothing outside of that is anything that's been given to me.

Q. Okay.

A. So the -- sorry.

Q. Sorry. Go ahead.

A. So to finish the answer, I would say that it's probably something that myself or Dr. Teeter...

Q. Do you know who the owner of the website is?

A. Aside from what is stated in the footnote, no.

Q. Okay.

Did you perform any fact checking on the website before citing it in your report?

A. No. If I had to fact check every document that I cited, I wouldn't be here because I'd still be working on the document. There are just too many documents for me to do so.

So that -- that's not my -- that's not even part of my goal in providing

background facts.

Q. Would you agree that when providing information in an expert report, it's important that the information you provide is reliable?

MR. SNIDOW: Objection to form.

A. To the extent that I can find that it is reliable, I'll rely on it. However, if it doesn't form the basis for an opinion, and it's just background information, it's far less important.

BY MS. SILVERSTEIN:

Q. Does the background information, does that help form the basis of any of your opinions?

A. Not in the slightest.

Q. Okay. When determining whether there's an association between a chemical and a disease, would you agree that a literature search is a key step?

A. Certainly.

Q. And a literature search should be crafted to produce both positive and negative results, correct?

A. All results, yes.

If there are no negative results or no positive results, you can't craft a search to do something that it cannot provide, however.

Q. If you don't craft a search to include any relevant or any positive or negative results that exist, you can't review all of the information; is that right?

MR. SNIDOW: Objection to form.

A. I interpret that question as saying if it's a poorly formed search can you have inadequate results of the search? And if I'm correct in that interpretation, then my answer would be yes, I agree.

BY MS. SILVERSTEIN:

Q. Did you perform -- you performed a literature search for these reports; is that right?

A. Myself and Dr. Teeter did, yes.

Q. Did you perform the search on PubMed?

A. Typically PubMed or Google Scholar. Although there are proprietary academic databases as well that I use.

Q. How did you determine which

studies to include in your report?

A. Well, there's a lot of different studies in my report. Since we're talking about the background facts --

Q. In your report, when discussing kidney cancer or Parkinson's disease, how did you determine which studies to include in your report?

MR. SNIDOW: Object to form.

A. So what I would say is it depends on what I'm relying on the study for. If I'm relying on the study or the description for background facts, that's going to be different. But if I'm relying on the study for a strength of association, or for fulfilling the Hill Criteria, or a different aspect of the Hill Criteria.

So there's going to be closer scrutiny on how a study was done if I'm relying on the study for fulfilling some of the Hill Criteria, particularly strength of association.

BY MS. SILVERSTEIN:

Q. So when you're looking at a study to determine -- when you're determining

what studies to include, in an expert report when discussing the Hill Criteria, how do you determine which studies are included?

MR. SNIDOW: Object to form.

A. Well, it's going to be based on the level of evidence that's provided by the study. So case studies are going to be least helpful. Retrospective studies, observational studies will be much more helpful and really in many ways the only kind of studies we can look at.

And then meta-analyses of such studies are going to be the -- sort of the first line of information that I'm going to be looking at.

BY MS. SILVERSTEIN:

Q. So let's take meta-analyses, for example.

How would you determine whether or not to include a meta-analyses in your report when discussing or evaluating the Bradford Hill criteria?

A. I believe both of my reports included all of the meta-analyses that were relevant that were found.

So positive and negative meta-analyses need to be described, because they are the largest bodies of evidence.

Q. And how do you determine whether or not a meta-analyses is relevant?

A. Well, it has to do with whether or not it is addressing the question of interest. So a meta-analysis of -- it doesn't involve, for example, TCE and kidney cancer, or TCE and Parkinson's Disease, is not going to be very relevant unless I'm looking to fulfill an analogy, for example. If there was thinner evidence for strength of association and consistency, I might have to look at the analogy, which might involve a seemingly less relevant topic of study.

Q. So, for example, if you're talking about kidney cancer and TCE, should all meta-analyses that discuss or analyze kidney cancer and TCE be included?

MR. SNIDOW: Object to form.

A. Not if they -- if they've been supplanted by new information. So if there's a meta-analysis that was done in 1991 or 1995, and then there's a meta-analysis of the

same literature plus new literature up and to 2020, for example, I'm not going to use the older meta-analysis. I'll use the newer one that supplanted the old one. So the most current meta-analyses are going to be the ones that are going to be included, typically, and older ones are of less benefit if the science is evolving over time.

BY MS. SILVERSTEIN:

Q. And how do you determine when a meta-analyses has been supplanted?

A. By doing a review of the literature and seeing if such a thing exists.

Q. So if the study -- in order for you to consider a meta-analyses to have been supplanted, does a later meta-analyses need to analyze all of the same studies plus new ones? Or just some of the same studies? Or does it just need to be more recent in time?

MR. SNIDOW: Objection, form.

A. It depends. All of that would be considered. Causal analysis is based on a -- on the conceptual framework of a web of evidence. And so you can have little bits and pieces of that web that are investigated

and included, in coming to a conclusion. The process is not based on a chain where any weakness means that the entire -- the whole entire body of information is rejected.

So if there was just a more recent meta-analysis, that very well may be included. Even if it doesn't include the older studies. It just depends on what I find in the literature.

I didn't write those studies, so I have to look and see what everybody else has provided for me.

BY MS. SILVERSTEIN:

Q. If someone was trying to understand what process you followed in, for example, your kidney cancer report, to determine whether or not to include a study, how would you describe that decision-making process to them?

A. Much in the way that I've just described it. The most recent, larger, well designed studies will be included. Outdated information will be less likely to be included unless it's just for giving historical background on what we used to

think and what we think now.

Q. How do you determine whether or not a study is well designed?

A. Well, certain aspects need to be fulfilled for the study to be considered well designed sufficiently to rely on it. That are based on basic epidemiologic tenets of controlling for bias and confounding, and using appropriate well-accepted study designs such as cohort, retrospective or prospective, although prospective doesn't work for this particular topic, but retrospective cohort design or case-control design. Those are really the two main study designs that we have with the exception of the one twin study that was done by Goodman for looking at Parkinson's Disease, which is a bit different than those -- than the other study designs.

And then ultimately it comes down to a matter of judgment of the individual epidemiologist.

Q. So do you agree that when determining -- when deciding whether or not a study is high quality, you would need to consider whether or not they account for

confounding or bias?

A. Yes, the design needs to, typically, have some control for bias or at least describe the role the bias might play so that it can be evaluated by the reader.

Q. And you also said that in addition to whether or not the study is well designed, you consider whether it's outdated; is that right?

A. If the information has been supplanted by other information that is of better quality, then it doesn't make any sense to go back and rely on older, outdated information. So, yes.

Q. How do you determine whether or not a study is outdated?

A. By whether there's a newer study with -- that was better designed or has more information that makes sense from a scientific or biological perspective.

For example, if you're looking at cancer, more lag time is typically going to be better for a study, because cancers require time for them to manifest.

So just -- there's a lot of

little bits and pieces to understand about these studies, and so each study is evaluated individually, and that's why my, unfortunately, report had to be 70 pages long.

Q. Did you make the decisions about whether or not to include a specific study yourself or did someone else help make those decisions for you?

A. Are you referring to Dr. Teeter?

Q. Dr. Teeter or anyone.

A. Well, no one else from my practice was involved with the analysis, so there wouldn't be anybody else. Everything that goes in -- went into these reports was a result of work that we did together, so...

I mean, if you're asking me if I had input from the attorneys, for example, that would not be my normal process. My normal process is to do the science.

Q. Are there studies that Dr. Teeter made the decision not to include that you did not review?

A. Possibly. I did not -- it

wasn't my hands over his hands on the laptop figuring out what he's looking at. So he has to make those critical decisions, which he's very, very capable of.

Q. So sitting here today, you can't tell us whether or not a high quality study was excluded by Dr. Teeter in his analysis?

MR. SNIDOW: Object to form.

A. In my experience with Dr. Teeter for over ten years, that has never happened, and I wouldn't expect that to happen.

BY MS. SILVERSTEIN:

Q. You didn't review the studies that he excluded, correct?

A. No, but we used the same methodology for including studies.

Q. But you didn't review the studies that he chose to exclude?

A. If there were studies that were not relevant -- that he felt were not relevant, I didn't ask to see the ones he said were not relevant, no. That's not -- would not be how we operate.

Q. And if there were studies that Dr. Teeter did not include because they were not relevant, you didn't review those studies either, correct?

MR. SNIDOW: Objection, asked and answered.

A. I would say I would give you the same answer for that, which is we use the same criteria, generally for what is an acceptable study. For example, case series or case studies are mostly excluded from any of the analysis that I do, because they're not super helpful for causal analysis, although they can give some degree of information.

BY MS. SILVERSTEIN:

Q. Did the plaintiffs provide you with any studies that they asked you to specifically include?

A. You mean was I instructed by plaintiffs to include certain studies?

Q. Yes.

A. I don't have a specific recollection of that; however, when I'm working on a case which is very broad in

scope, I will ask for retaining attorneys to send me whatever literature you have, which will shortcut some of my work. And then it's up to me to determine whether or not the study is relevant for inclusion in my review.

Q. Are there any studies that you reviewed and considered that you did not cite in your report?

A. Those would be the studies that were rejected for quality or relevance, so probably.

Q. Are there any studies that you considered that contributed to your opinion that you didn't include in your report?

A. No.

MS. SILVERSTEIN: We've been going a little over an hour. I think this is a good time to take a break.

THE VIDEOGRAPHER: We are off the record at 10:08 a.m.

(Recess taken, 10:08 a.m. to 10:19 a.m. PDT)

THE VIDEOGRAPHER: We are on the record at 10:19 a.m.

BY MS. SILVERSTEIN:

Q. Dr. Freeman, did you talk to anybody about the substance of your testimony during the break?

A. I went downstairs and introduced myself to my insurance agent and told her I was upstairs testifying, but I don't think I gave her any details that were relevant.

Q. Great.

A. I mostly just thanked her for taking care of my mom who is probably driving her crazy.

Q. Understood. I notice that you have a laptop in front of you. Well, two laptops in front of you.

One from Golkow, and is the other one a personal laptop?

A. It is.

Q. Why did you bring your laptop today?

A. In case you asked me something that I need to look at my file for.

Q. And what information is on your laptop?

A. The file.
Q. Is there anything else on the laptop?
A. Yeah. Tons of stuff.
Q. Is this a personal laptop that you use in your daily forensic practice?
A. Yes.
Q. And have you looked at that laptop since the deposition began?
A. No, I haven't.
Q. And did you look at anything on the laptop during the break?
A. I didn't.
Q. Dr. Freeman, would it be fair to say that in epidemiology, in association, isn't the same thing as causation?
A. I think it's fair to say that with science generally, but very specifically to epidemiology, yes as well.
Q. And you typically wouldn't draw a conclusion about causation from a single study, right?
A. Depends on the study.
Q. Okay. In what circumstances would you draw a conclusion about causation

based on one single study?

A. Well, if I have information that is collateral to that study, that says that there's a causal relationship between, for example, a substance, like TCE and kidney cancer, and then there's a single study of a population, for example, like the residents of Camp Lejeune over certain periods of time that compares their outcomes for kidney cancer to another place, for example, Camp Pendleton. Of course, I'm speaking of the Bove study, B-O-V-E.

Then that will be a study that was not taken on its own. In other words, it's not describing the relationship between TCE and kidney cancer for the very first time. It's building on that information but talking about a specific population.

So if we're talking about a specific population, then I can use that study, because the only way you can actually understand what's happening within a specific population is to study it.

Q. Okay. So if I'm understanding correctly, in your opinion, could you

consider just a Bove study to determine whether or not TCE causes kidney cancer?

MR. SNIDOW: Object to form.

A. No. No, absolutely not. Nor would I. The Bove study tells me whether exposure to Camp Lejeune water causes kidney cancer. The additional information addressing plausibility of that relationship is the information I was talking about as far as background information.

BY MS. SILVERSTEIN:

Q. Okay. And what kind of information are you considering background information?

A. Well, if we know, for example, there are these four chemicals that are present in Camp Lejeune water, and there is background information showing that the chemicals individually or acting together can and do cause kidney cancer; and that we also see that in Camp Lejeune residents, they have a higher rate of kidney cancer, then you would expect, if there was not something in their environment that was causing that illness, and we know that there is good

casual information about TCE being a cause of getting cancer, then we can put that information together. So I now can say something about people being at Camp Lejeune, being at Camp Lejeune, drinking Camp Lejeune water, can and does that cause kidney cancer. The mechanism by which it does so would then be associated with the exposure to the four chemicals of interest.

Q. Okay.

Maybe I'm a little bit confused. Would you consider that drawing a conclusion based on a single study?

MR. SNIDOW: Object to form.

A. It would -- it consists of me drawing a conclusion about Camp Lejeune exposure causing cancer, but not based on a single study to determine the -- whether the Hill Criteria are met to say was the exposure at Camp Lejeune the cause of the kidney cancer, some of the kidney cancer that we're looking at.

BY MS. SILVERSTEIN:

Q. Let's be more specific. If you wanted to know whether vinyl chloride causes

kidney cancer, would you look at a single study to make that determination?

MR. SNIDOW: Object to form, asked and answered.

A. And just to be clear, when you're saying a single study, you're not referring to a meta-analysis, you're referring to a single study of vinyl chloride.

BY MS. SILVERSTEIN:

Q. Correct.

A. It would depend on what the additional information was out there, but generally no, I would not do so.

Q. A study's risk ratio indicates the level of association observed by the study, right?

A. That's one measure of it, yes.

Q. A risk ratio of 1.0 indicates no association, right?

A. No association above equipoise, correct.

E-Q-U-I-P-O-I-S-E.

Q. And when you say no association above equipoise, what do you mean?

A. It's a different way of saying what you just said. 1.0 is considered a level of equipoise, where there's a balance between factors.

Q. Okay. Would 1.0, is that -- does that indicate that this study does not show -- this specific study does not show evidence that a specific chemical causes a specific outcome?

A. It does not show that the chemical causes a specific outcome at a level greater than the control population.

Q. What level of risk ratio do you consider to show there to be an association?

MR. SNIDOW: Objection to form.

A. It depends on the measure that I'm using to determine whether or not I believe that the -- an association is present or not, or whether it's explained by other factors such as random scatter in the data.

BY MS. SILVERSTEIN:

Q. Okay.

A. So anything over 1.0 with a confident interval that does not cross the 1.0 boundary at the 95% level is the most

commonly used measure; however, there are other measures used as well, particularly depending on the populations that are studied.

Q. Are you familiar with Dr. David Savitz?

A. David Savitz.

Q. Savitz?

A. Could you spell it, please.

Q. S-A-V-I-T-Z?

A. I don't know him personally, no.

Q. Are you familiar with his work?

A. Offhand, I can't say that it's ringing a bell, but if you showed me something I might say, oh, yes, I know that document, for example.

Q. Have you, to the best of your recollection, ever reviewed or referenced Dr. Salvitz's book Interpreting Epidemiological Evidence?

A. I don't recall.

Q. Have you reviewed or referenced his book Epidemiology and the Law.

A. No, I don't think I have.

Q. If Dr. Savitz defined a modest association as a relative risk of 1.2, would you agree with Dr. Savitz?

MR. SNIDOW: Objection to form.

A. Yes, that's a reasonable characterization for a 20% increased prevalence of an illness or disease.

BY MS. SILVERSTEIN:

Q. And if Dr. Savitz defined a larger association as having a risk ratio of 1.5 or higher, would you agree with Dr. Savitz?

A. Mathematically. You can't really argue with that. That is 1.5 is more than 1.2.

Q. Would you agree that it's important to analyze the precision of a study's risk estimate?

A. Yes.

Q. And one way you can do that is through the 95% confidence interval, right?

A. That is one way to do it, yes.

Q. When do you consider a confidence interval to be wide?

A. It depends. If a confidence

interval -- if a confidence interval is over the 1.0 in the lower bound, then a wide confidence interval may not be too much of a factor, it just represents the fact that there is a small number of study subjects or affected individuals. But if you have a confidence interval that is, again, the lower bound is not below 1.0, then you would be able to still say, well, there's scatter here, but it's still reliable enough to say, I think this association is real, that is due to the effect of the exposure.

If it -- the lower bound dips below 1.0 but stays relatively tight and there is an association that's greater than 1.0, then that may be considered as positive evidence.

So you really have to take each study finding as its own idiosyncratic outcome and make a judgment about it. There is the talk about the confidence interval ratio in some of the materials that I've reviewed, and I've talked about that in my reports, which says that there shouldn't be a ratio that's more than three if you have --

particularly if you have a relatively low confidence -- or excuse me, point estimate. That's a reasonable approach as well.

So it's -- there's various ways to look at various kinds of information to try to improve the precision of a conclusion.

Q. Sure. And I think my question is maybe a little different. I'm not asking about how you determine whether or not a study should be considered based on the confidence interval, but rather when you're looking at a confidence interval, how do you determine whether it's a narrow confidence interval versus a wide confidence interval?

MR. SNIDOW: Objection to form.

A. Just as a very broad term, it would depend on the confidence interval I was looking at. If I saw a point estimate of 2.5, and the confidence interval was 1.05 to 50, I would consider that very, very wide.

But if it was a -- the confidence interval was 1.05 to 4.1, for example, I would consider that fairly narrow.

So because it's more or less even around the point estimate.

BY MS. SILVERSTEIN:

Q. Okay. So then would something you look at be how far on each side of the point estimate the confidence interval is?

A. That would be one way to look at it, particularly if the confidence interval is -- or excuse me, the point estimate is a bit higher.

Q. Okay. And the wider the confidence interval, the less confidence in the point estimate, right?

A. I don't know that I would say that. I mean, from a biostatistical perspective, if you have a 1.05 and a 50 at the top, or bounded around 5.0, for example, that would still be considered a reportable outcome. You would probably discuss in the limitations of that outcome, the fact that's got a pretty wide confidence interval, however, and say that, you know, scatter may have something to do with it, but based on the definitions that we're using, which is 95% confidence interval, you would say it's still equal to a peak value of .05 or less.

Q. And, you know, again, I'm not

asking you about whether or not you would still consider a study, but generally speaking, would a study with a wider -- or a result with a wider confidence interval versus a narrower confidence interval, would you have less confidence in the study -- in the results with the wider confidence interval?

MR. SNIDOW: Objection, form, asked and answered.

A. Generally. It depends on how it fits into the rest of the evidence. I was talking about a web of evidence. As a piece of the web, if that's the only piece I've got, I'm going to have less confidence than if I have a stronger piece. But if it's part of other evidence, then it all can sort of fit within the web.

So it depends on what else there is that's out there.

If it's that one study, I'm going to have less confidence in it than if there's another study that has a much tighter confidence interval.

BY MS. SILVERSTEIN:

Q. When determining whether a study supports a causalization, you would consider statistical significance, right?

A. Of course.

Q. And one way you can consider statistical significance is by the p-value, right?

A. Sure.

Q. And would you agree that a p-value less than 0.05 is considered to be statically significant?

A. Almost universally, that would be considered to be statically significant for almost all studies; although .1 is also considered as a well-known statistic of significance depending on the study.

Q. And you said .1 is considered a level of statistical significance?

A. Yes.

Q. What is that based on?

A. What is --

Q. How do you determine that the .05 or .1 p-value applies to a study?

A. It depends on your data and the

source of your data.

If your best -- if your best data showed that you've got statistical significance at .1 rather than .05, but there's other information that suggests that a -- an association is causal, then you're going to pay more heed to it. You're not going to say, we're going to ignore it.

Again, it's part of the web of evidence that you are looking at. These numbers are all arbitrary. So .05 just says there's a 1 in 20 or less chance that the result that we got is due to random scatter. .1 says there's less than 1 in 10 or 1 in 10 or less chance that the results are due to random scatter.

What's your tolerance for random scatter has to do with the topic that you are studying, and the source of the data.

Q. Is there -- are you aware of an authority that says that the -- what is considered statistically significant changes depending on the study?

A. Yeah, there's a lot of debate about the .05 level of statistical

significance in the epidemiological and biostatistical community, and there's lots of discussion about that. It's -- there is -- there are many in the general community who feel that it should play much, much less of a role than it does in describing the results of studies and what gets published and what doesn't get published.

Q. And maybe I'm a little bit confused, but it sounds like you're saying that a study can be statistically significant at a higher p-value depending on other information besides just the study results; is that right?

A. More or less, yes. That you -- because .05 is an arbitrary number. .1 is equally arbitrary.

Q. And how does information external to the study change whether or not a study is statistically significant?

A. Do you mean at the .1 or .05 value? What that level of statistical significance is? Because the statistical significance, if it's preset, is going to be a matter of numbers and variants in the data.

Q. What do you mean by if statistical significance is preset?

A. You pick before you do your study whether you're willing to -- whether you are willing to accept a lesser value of statistical significance to say, I think we've got a result that is reliable.

Q. So whether or not a study is statistically significant depends on whether it meets the standards set by the study author?

A. Yes. It's called an a priori -- A P-R-I-O-R-I -- set value for significance.

Q. And can you also determine statistical significance by looking at confidence intervals?

A. Well, you can determine whether they've fit within a preset value. I mean, if you say 1.0 is the lowest that I'm going to go, then that's the lowest you're going to go on your -- on the lower bound of your confidence interval, or upper bound, depending on what you're looking for in your study, whether it's protective or harm --

protection or harm that you're looking at.

But you can accept a wider confidence interval as well.

Q. So there's not a generally accepted confidence interval range that is considered statistically significant; is that right?

MR. SNIDOW: Object to form.

A. I can tell you what is most common, which is above or below 1.0, depending on whether you're looking at an upper or lower bound.

That's most common for the 95% confidence interval that's used in most studies that you see, but there are other studies that are -- accept a lower level of statistical significance to take action.

For example, a study of getting pregnant women antiretroviral therapy when they're HIV positive, to see whether that prevents vertical transmission. You're not waiting to get to .05 before you say, oh, it's protective. Stop the trial. Give everybody the drug, which is actually what happened, going back to the early '90s. I

think it was early '90s when that happened.

So that would be a good example where tolerance for scatter is increased, because of the type of study that's being done.

BY MS. SILVERSTEIN:

Q. But you would agree that the most commonly accepted confidence interval, when looking at statistical significance, it's most commonly accepted that if a confidence interval goes below one it's not statistically significant; is that fair?

A. Most commonly, yes. There may be something that's considered to be a trend towards confidence. For example, if it's .98 on the lower bound, and 3.5 or around 1.5, that's going to be probably considered just about as good.

But if you've got .5 up to 2.5, around a point -- a 1.02, you're not going to say that 1.02 actually has meaning.

Q. Okay.

A. That's when you're going to step back and say, wait a minute, this is pretty close to equipoise.

Q. Okay.
A. And the rest -- and any association there is most likely explained by the amount of scatter that's being represented by that wide confidence interval that's far below one.
Q. And, Dr. Freeman, in your kidney cancer and Parkinson's Disease reports, you evaluated the four chemicals TCE, PCE, vinyl chloride and benzene individually, right?
A. Yes, and collectively.
Q. Sure. That was going to be my next question.
You also retain -- also, excuse me, analyzed them as the total of the OCE amount in the water, right?
A. Yes.
Q. When you're talking about your opinions that the Camp Lejeune water can cause kidney cancer or Parkinson's Disease, what combination of contaminants are you identifying?
A. The four chemicals that you've described are the only ones I've examined.

Q. So when you're offering those opinions, are you referring to when all four of the chemicals are present in the water?

A. When I'm referring to exposure to Camp Lejeune water, by definition, all four chemicals are present in the water.

Q. Are you familiar with the ATSDR Camp Lejeune water model?

A. Yes.

Q. Does your opinion that the Camp Lejeune water can cause kidney cancer or Parkinson's Disease, does that opinion apply to all locations on base?

A. It doesn't differentiate between all the locations. And I know that the water has been modeled to have different concentrations at different locations, but there isn't good evidence that there is a big difference between locations on base that I've seen. It's more generally Camp Lejeune exposure.

Q. Do your opinions that the Camp Lejeune water causes kidney cancer and Parkinson's Disease, does that apply to all years that the water was contaminated between

1953 and 1987?

A. I haven't examined that time frame specifically to determine whether the exposure would begin. No one has actually asked me that. I would say that exposure from that time forward is what's covered by my opinion, but whether there was any evidence for contamination before that time is something that I haven't seen. So I -- I haven't attempted to say that someone who was on base in 1950, for example, had some degree of exposure. It's not something I've even examined.

Q. Sure. And I'm not asking about anything later than 1987 or before 1953. I'm not asking about --

Does your opinion that Camp Lejeune water can cause kidney cancer and Parkinson's Disease, does that apply to every year between 1953 and 1987?

MR. SNIDOW: Objection, form, asked and answered.

A. I've seen no evidence that would allow me to discriminate between years of exposure.

BY MS. SILVERSTEIN:

Q. And you said you're familiar -- you are aware of the ATSDR water model; is that right?

A. Yes.

Q. Have you ever reviewed it?

A. It's really out of any area of expertise, water modeling. So I've reviewed it into understanding what's being referenced, but the methods that are used are not methods that I could critique or give input on.

Q. Since you have reviewed it, not in a water modeling context, you are aware that the ATSDR models contaminate concentration levels differently depending on the time frame, right?

A. Yes.

Q. And there were some years of ATSDR model that had only one or two chemicals present, right?

A. Yes.

Q. Does your opinion that the Camp Lejeune water causes kidney cancer and bladder cancer apply to any combination of

contaminants that ATSDR models?

A. I haven't seen any evidence that would allow me to discriminate between years, depending on the level of contaminants modeled by ATSDR or anybody else.

Q. What scientific literature did you review that discusses the carcinogenic effects of the mixture of TCE, PCE, vinyl chloride, and benzene?

A. It's described in my report. Would you like me to turn to that page?

Q. The literature you reviewed is described in your report? Is that what you mean?

A. Yes.

Q. And are you referring to the Mauderly article?

A. I'd have to turn to the page to tell you which -- which article that was and how I was relying on it.

MR. SNIDOW: Do you want to just show him, Ms. Silverstein?

BY MS. SILVERSTEIN:

Q. So you can go ahead and turn to page 40 of your Parkinson's report.

Is this the literature that you're referring to?

A. Sorry. I picked up the wrong report.

MR. SNIDOW: For the record, it's Exhibit 3.

THE WITNESS: Thank you.

MR. SNIDOW: You're welcome.

A. Yeah, probably for this report it would be the discussion on page 40.

BY MS. SILVERSTEIN:

Q. Okay. And the literature that you say on page 40 is Mauderly and Samet, correct?

A. I cite to Bove.

Q. When discussing mixtures? You said -- when you say you cite to Bove, you're talking about the Bove studies that looked at the Camp Lejeune population, right?

A. Right. By definition, they're looking at all chemicals working in conjunction with each other.

Q. Sure. Did you review any literature that talked about the possible synergistic effect of these four chemicals?

MR. SNIDOW: Objection to form, asked and answered.

A. Yes, I did. That is the Mauderly report, which is M-A-U-D-E-R-L-Y.

BY MS. SILVERSTEIN:

Q. And is it your opinion that the Mauderly report specifically addresses these four chemicals?

The Mauderly study specifically addresses these four chemicals?

A. No.

Q. What literature did you review that discusses the synergy or possible synergistic effect of TCE, PCE, vinyl chloride and benzene?

MR. SNIDOW: Objection to form, asked and answered.

A. We'd have to go back to Bove. The evidence that when people were exposed to all four chemicals, that there was increased evidence for illness is the best evidence that we have of an effect of all four chemicals working together.

BY MS. SILVERSTEIN:

Q. You didn't review any other

literature that discusses the synergistic effect of those chemicals, right?

MR. SNIDOW: Objection to form.

A. Not that I referenced in my report, no.

BY MS. SILVERSTEIN:

Q. Did you review any literature discussing the synergistic effect of those four chemicals that you considered for your report and didn't cite in your report?

A. Not that I recall.

(Freeman Deposition Exhibit 4, 1-20-2017 ATSDR Public Health Assessment for Camp Lejeune Drinking Water, was marked for identification.)

BY MS. SILVERSTEIN:

Q. Dr. Freeman, you were just handed Exhibit 4, which is the: 2017 ATSDR Public Health Assessment.

Have you reviewed this document before?

MR. SNIDOW: Do you have one for me?

MS. SILVERSTEIN: I don't.

MR. SNIDOW: That's all right.

MS. PLATT: Can I upload it for you?

MR. SNIDOW: No. Just give me a second to pull it up.

MS. SILVERSTEIN: Sure.

MR. SNIDOW: All right.

A. There's a pending question?

BY MS. SILVERSTEIN:

Q. Have you reviewed the ATSDR 2017 Public Health Assessment before?

A. I have.

Q. And, Dr. Freeman, would you agree that a claim that two chemicals have synergy requires scientific evidence?

A. Give that to me one more time, please?

Q. Would you agree that a claim that two chemicals have synergy require scientific evidence?

A. Yes.

Q. And did you review the EPA toxicology review for TCE, PCE, vinyl chloride, or benzene?

A. I did.

Q. So you would -- you would have

reviewed EPA's discussion of the possible synergistic or additive effects in those profiles, right?

A. I would think so, yes.

Q. Go ahead and turn to page 33 of Exhibit 4.

MR. SNIDOW: Internal page --

MS. SILVERSTEIN: The page numbered 33.

MR. SNIDOW: Thank you.

BY MS. SILVERSTEIN:

Q. Are you on page 33, Dr. Freeman?

A. I am.

Q. On page 33, ATSDR has a section titled: Evaluation of Combined Cancer and Noncancer Effects of Exposure to Chemical Mixtures.

Right?

A. Yes.

Q. And then there is a subheading that says: PCE-TCE Interaction.

Do you see that?

A. Yes.

Q. And then, about three sentences

in, the sentence starting: TCE is generally...

Do you see that sentence?

A. Yes.

Q. It says: TCE is generally metabolized at a higher rate than PCE. As a result, TCE is primarily eliminated from the body in the urine, whereas PCE is eliminated primarily by exhalation. Evidence in animal studies suggest that PCE will inhibit the metabolism of TCE. However, that effect may only occur at exposure doses that are much higher than could have been experienced by individuals contacting water from the Camp Lejeune systems. There does not to be evidence of synergistic effects (i.e., greater than additive) resulting from combined exposures to PCE and TCE.

Did I read that correctly?

A. Yes.

MR. SNIDOW: I think you -- just for the record, think you missed an appear. "There does not appear to be evidence."

MS. SILVERSTEIN: Thanks.

MR. SNIDOW: But I won't make you reread it.

A. I retract my answer. No.

BY MS. SILVERSTEIN:

Q. The last sentence is: There does not appear to be evidence of synergistic effects (i.e., greater than additive) resulting from combined exposures to PCE and TCE.

Did I read that correctly?

A. Yes.

Q. The sentence says: The results of the Binary Weight of Evidence (BINWOE) analysis from the Interaction Toxicological Profile (ATSDR 2004; shown in Appendix D) shows that the effects of TCE on PCE are considered to be additive and the effect of PCE on TCE toxicity are additive for neurologic defect and slightly inhibitory for effects on the liver and kidney (likely due to the effects on TCE metabolism) (ATSDR 2004).

Did I read that correctly?

A. Yes.

Q. You can go ahead and set

Exhibit 4 aside.

I want to turn back to Mauderly and Samet.

(Freeman Deposition Exhibit 5, Is There Evidence for Synergy Among Air Pollutants in Causing Health Effects? (Mauderly/Samet), was marked for identification.)

BY MS. SILVERSTEIN:

Q. Dr. Freeman, you were just handed Exhibit 5, which is titled: Is There Evidence For Synergy Among Air Pollutants in Causing Health Effects. By Mauderly and Samet.

Do you see that?

A. Yes.

Q. And this is the article that you reviewed when discussing synergy and your Parkinson's opinion, correct?

A. Yes.

Q. You would agree that this article is specifically discussing air pollutants, correct?

A. Yes.

Q. It's analyzing potential

synergy between ozone and other pollutants, right?

A. Yes.

Q. If you go ahead and turn to Table 3.

A. Is that a trick question?

Q. Yeah.

A. Or is it Table 1? That's it.

Q. Okay. Go ahead and set that aside.

This article didn't consider kidney cancer, correct?

A. No. It wasn't specifically to the chemicals at Camp Lejeune, or in the Camp Lejeune water, nor is it specifically to the specific illness that -- either Parkinson's or kidney cancer.

Q. You agree it's not specific to the chemicals that were present in the Camp Lejeune water?

A. Yes.

Q. You can go ahead and set that document aside.

A. I already done did that.

Q. Great.

You would agree that -- well, I guess I want to turn to the Bradford Hill criteria now.

You analyzed the Bradford Hill viewpoints for both of your reports, right?

A. I did.

Q. And you applied the Bradford Hill viewpoints separately for each of the chemicals as well as the Camp Lejeune water, is that fair?

A. Yes.

Q. Before applying the Bradford Hill viewpoints, would you agree that an association needs to be more than just observed?

MR. SNIDOW: Objection to form.

A. How else do you observe something if you don't observe it? I think the question is baffling me.

BY MS. SILVERSTEIN:

Q. Would you agree that an association shouldn't be -- before applying the Bradford Hill criteria, association doesn't need to be -- needs to be more than just observed? In other words, it needs to

be clear-cut?

A. Those aren't terms that I would normally hear. I mean, observational study is how we find associations.

So observation is a critical part of finding an association.

Q. And if the observational studies all show no association --

A. Oh.

Q. -- you wouldn't apply the Bradford Hill criteria?

A. I understand what you're saying.

MR. SNIDOW: Hold on. Let me get an objection to form in. Go ahead.

A. I understand you now. I wasn't clear on what the question was.

There needs to be an association that is, I think in your terms, is greater of an equipoise potentially or one that is demonstrated to some degree of statistical reliability or precision.

Am I interpreting the question correctly?

BY MS. SILVERSTEIN:

Q. So when you're looking at observational studies, before applying Bradford Hill criteria, you would need to see a clear-cut association in the observational studies, correct?

MR. SNIDOW: Objection, asked and answered.

A. It truly does depend on the situation. An emerging threat, there may not be information that is reliable to -- enough on a large population based -- large population basis to draw a highly reliable conclusion, but there still may be a danger that's perceived. So a public health protection always comes first in such an analysis. So it very -- it is very idiosyncratic to the situation.

BY MS. SILVERSTEIN:

Q. How did you determine that there was an association between the Camp Lejeune water and the four chemicals -- or the Camp Lejeune water and the four chemicals and kidney cancer or Parkinson's Disease in order to apply the Bradford Hill criteria?

A. Well, because the chemicals that were established to be present in the water were plausibly associated with both diseases based on a variety of literature that's been present for decades. An evolving understanding of the effects of the four chemicals individually, along with studies of people who have been exposed to Camp Lejeune water compared to people who had been exposed to water from another source, such as Camp Pendleton.

So I have both general causation for the individual chemicals, but also for the specific combination of chemicals that people were exposed to at Camp Pendleton, which, as ATSDR said, is additive. So when you get one chemical, it's not just that one chemical, you add the other chemical and we don't know if it's synergistic, for example, benzene, or vinyl chloride. But at least we know that some of the effects are reasonably additive. You have to look at the people who were exposed, and so those studies are going to be -- the studies that I referred to, Bove and Goodman are going to be

the best studies, the best evidence that we have.

Q. When determining whether there's a causal relationship between a chemical and a disease, it's appropriate to look at studies looking at that specific chemical and that specific disease, right?

A. Typically, yes.

Q. One of the Bradford Hill viewpoints is strength of association; is that right?

A. It is.

Q. And would it be fair to say that the higher the relative risk, the greater likelihood that the relationship is causal?

A. Generally, that's true, unless it's a heavily confounded relationship.

Q. And similarly, the lower the relative risk, the less likely the relationship is causal, right?

A. Not necessarily, no.

Q. When would that not be true?

A. If you have good consistent evidence of an association over multiple

studies, and multiple populations, and you have a good plausible biologically credible link between the exposure and the illness, even a small association can be highly likely, as long as it is repeatedly seen.

Q. That -- it would be less likely that that small association represented causation than if that consistent association was higher, right?

MR. SNIDOW: Objection to form, asked and answered.

A. No, it's no longer a factor once you have consistency. That -- the degree of the strength of the association or relative risk is no longer a factor to consider. It's when we're talking about, for example, the first study that was ever done, and you see a ten times greater illness in an exposed population than an unexposed population, you think, boy, maybe that exposure is causal. Whereas, if you see a very small relationship, let's say 1.2, then, I agree with you, that's -- you're -- you are much more likely to believe that the ten times greater frequency as amongst the

exposed is real, and associated with the exposure than if it's only 1.2 because then there are other factors that might be at play. But for both relationships, if they're shown consistently, they're equally valid.

BY MS. SILVERSTEIN:

Q. You'd agree that it's possible for a relative risk to be elevated due to bias or confounding, right?

A. Of course.

Relative to the actual relative risk for the exposure. As opposed to the one that is influenced by threats to the study of validity.

Q. Another Bradford Hill viewpoint is consistency, right?

A. Yes.

Q. It's important that a study be replicated in different populations and by different investigators to -- before a causal relationship is accepted, right?

A. Generally, yes.

Q. It's important that different studies examine the same exposure-disease relationship -- excuse me. It's important

that different studies that examine the same exposure-disease relationship yield similar results, right?

MR. SNIDOW: Objection to form.

A. Depends on the -- what we're talking about. If we're talking about something that's highly variable, like the amount of VOCs in drinking water from one population to another population, you don't have to show that you're going to get the same degree of association necessarily. It can definitely vary. Because there are other variables that are going on there, which may have to do with the concentration of the VOCs in the environment.

BY MS. SILVERSTEIN:

Q. So you wouldn't consider whether studies examining the same exposure-disease relationship yield similar results?

MR. SNIDOW: Objection to form, misstates testimony.

A. It depends on the circumstance. In the circumstance I just gave you, it would be less important than it might be if we were

studying, for example, the same population. But another investigator is studying the same population using the same methods, if they come up with very different results, then that has to be scrutinized more carefully.

BY MS. SILVERSTEIN:

Q. Evidence of consistency can come from multiple studies of varied populations, right?

A. Yes.

Q. Biological gradient is another Bradford Hill viewpoint, right?

A. Yes.

Q. Biological gradient means the outcome increases monotonically with increasing dose of exposure, right?

A. Yes.

Q. And that's also called a dose-response, right?

A. Yes.

Q. A dose-response relationship means that the greater the exposure, the greater the risk of disease, right?

A. Yes, a positive dose-response relationship, yes.

Q. Which means that a higher exposure or longer duration of exposure, you would generally expect to see a greater incidence of disease, right?

A. Generally that's true, yes.

Q. Because generally higher exposures should increase the incidence or severity of the disease, right?

A. Generally, that's true.

Q. And just like a dose-response gradient supports a causal effect, the absence of a dose-response gradient calls into question whether there's a causal effect, right?

MR. SNIDOW: Objection to form.

A. No, I wouldn't necessarily agree with that. It depends on the study. If we have a study where there's too much scatter at higher levels of exposure, so that you don't find that there is the -- a monotonic relationship for a gradient over multiple quintiles or tertiles of exposure. But an ever/never exposure does show a relationship. You also have to take that into account. So it really -- it really

depends on the data that you're looking at.
BY MS. SILVERSTEIN:
Q. You agree that you need to take into account the absence of a dose-response relationship, correct?
A. Right. You have to balance whether it's best explained by the fact that this web of evidence is incorrect, that other evidence should be ignored. Or that the evidence in this particular study didn't show this one particular aspect of a relationship. And does that mean that that evidence is no longer valid or -- the body of evidence is no longer valid or that the failure to meet a certain level of evidence, as part of the Bradford Hill criteria or viewpoints, are not met completely.
So it's -- you -- all of that evidence has to be weighed in relationship to what other evidences exist.
Q. One of the Bradford Hill viewpoints is also specificity, right?
A. Yes.
Q. Which means that -- an association exhibits specificity if the

exposure is associated only with a single disease or type of diseases, correct?

A. Yes.

Q. Because the vast majority of agents do not cause a variety of effects, right?

A. The vast majority of --

I have to think about that statement.

I think generally that's true, yes.

Q. And you would agree that a study that finds an agent is associated with many different diseases should be examined skeptically, right?

A. Well, all relationships should be examined skeptically, to make sure that there isn't some error being made.

However, because specificity so rarely met for disease to exposure ratio, like, for example, asbestos and mesothelioma. Which is one of the relatively few examples of a high degree of specificity between exposure and disease, it's -- specificity is often left out of applied Bradford Hill

criteria or viewpoints.

Q. You'd agree --

A. In the literature, I should say.

Q. You'd agree that if a study finds an agent is associated with a wide variety of diseases, you need to examine that study to determine whether confounding or bias was causing that wide variety of relationship, right?

MR. SNIDOW: Objection to form.

A. That would be important whether or not the exposure was associated with a wide variety or just one disease. You'd still want to examine the study for presence of bias and confounding.

BY MS. SILVERSTEIN:

Q. Do you weigh the Bradford Hill considerations relative to each other?

A. To some degree.

Q. Are there certain considerations that you give more weight to?

A. Certainly.

Q. Which considerations?

A. Temporality is critical. I

can't put the cart before the horses, as Bradford Hill said.

Q. So is it that if temporality exists, that is the most important Bradford Hill consideration for you?

A. Well, you can't not have a temporal order that is appropriate. You can't look at a population who may have had the disease before the exposure.

Q. You'd agree that you can have a population that acquired the disease after the exposure and causation or a positive association not exist, right?

A. Yes, but you have to have temporal order.

So it's critical that you meet temporality, but there's a reason there's nine viewpoints, or sometimes 10 or 11 viewpoints or criteria that are used for causal associations, or examination of causal association, because there -- none of them are really taken in isolation.

Q. Sure. Aside from temporality, what Bradford Hill criteria do you weigh the most heavily?

A. Well, obviously strength of association is an important measure. But it depends on the source of information for strength of association.

If the association is being examined in a very specific population, with a very specific exposure, like, for example, foodborne illness outbreak at a restaurant, then different Bradford Hill criteria are going to get different emphasis.

But establishing biologic plausibility as essentially a cumulative sort of analysis of the seven criteria that go towards biologic plausibility is probably -- I would put them all sort of collectively under one heading as being to some degree equally important. For example, you may -- the specificity is rare, but a really strong dose-response is a specialized form of -- can be a specialized form of like temporality, as is a dechallenge or rechallenge criteria, depending on what the exposure is that we're looking at. So without sounding like I'm vacillating, I have to go with it really depends on the circumstances. Bradford Hill

are used for pretty much all causal determinations, or they form a part of virtually all causal determinations, applied in a wide variety of areas. In fact, areas that I've written a lot about.

And that's why it's hard for me to give you a firm statement that, oh, I like strength of association first, and then temporality, and then I really like analogy, for example. It just depends on what the evidence is that you're evaluating.

Sorry for the bad answer.

Q. You need to evaluate both whether a Bradford Hill viewpoint is met and whether it's not met, right?

A. If you're doing such an analysis, yes, you would want to discuss whether you -- whether in your judgment the criteria is met or satisfied.

Q. Have you heard the saying the dose makes the poison?

A. I have.

Q. You would agree that risk depends on the potency of a chemical and the magnitude of exposure, right?

A. Well, generally. It depends on the population exposed. I mean, we're talking about long-term diseases. Then you're talking about illnesses that are associated with multiple factors. It's not like giving somebody cyanide, where if you give them a big dose, they're always going to die.

That's not what we're dealing with when you're talking about chronic illness or exposure to environmental factors that don't cause injury as opposed to -- or overt injury as opposed to long-term disease acquisition.

Q. Dr. Freeman, you would agree that someone who was exposed to a moderate amount of TCE for five years probably has a greater risk of developing a disease than someone who's exposed to a small amount of TCE for one year, right?

MR. SNIDOW: Objection to form.

A. As a general principle, all other things being the same and fixed, yes.

BY MS. SILVERSTEIN:

Q. And determining how much of a

chemical someone has been exposed to, involves an exposure assessment, right?

A. Of some form.

Q. And it could develop -- it could require a risk assessment, right?

MR. SNIDOW: Objection to form.

A. Can you give me a little more explanation as to what it is that you mean when you say that?

BY MS. SILVERSTEIN:

Q. Are you familiar with regulatory risk assessment?

A. Generally, yes.

Q. And regulatory risk assessment considers the amount of a chemical that someone is exposed to, right? Or population is exposed to, right?

A. Well, it considers maximum contaminant levels and other sorts of values, which are permissible or over a permissible level, if that's what you're referring to.

Q. You didn't conduct an exposure assessment here, right?

A. That's not quite correct. Exposure is not just the amount of a

chemical, it's also the duration of the exposure to the chemical. Once we know how often the chemical has shown up based on whether it's modeling, by somebody else, or some other information that's present, then the most relevant measure after that point in time is just duration of exposure.

Q. Dr. Freeman, you didn't analyze how long any person or group of people was exposed to contamination at Camp Lejeune, correct?

MR. SNIDOW: Objection to form, asked and answered.

A. There are exposure durations that are considered in some of my -- some of the literature that I've cited to.

BY MS. SILVERSTEIN:

Q. Did you do an assessment of how long anyone was actually exposed to a chemical?

A. No, I'm --

MR. SNIDOW: Objection to form.

A. My report is only addressing general causation issues, so I'm not addressing any individual's specific

circumstances.
BY MS. SILVERSTEIN:
Q. Would you agree that animal studies that don't reflect realistic dosage for humans are unreliable?
MR. SNIDOW: Objection to form.
A. It depends on what you mean by "unreliable." They're unreliable to say, here's a dose that we're going to set and say it's minimum or maximum or whatever the threshold is, because, you know, animals can have different physiologic responses than humans. And typically do.
However, to find out whether or not something is potentially dangerous or carcinogenic, the animal study may be very reliable to move on to the next step, which is to examine exposed human populations.
BY MS. SILVERSTEIN:
Q. But you would agree that you can't determine that a chemical is a human carcinogen, for example, based solely on animal studies, correct?
MR. SNIDOW: Objection to form.
A. I agree with that, not solely

on animal evidence, but they form the part of the web of evidence. Some studies form part of the web of evidence, I should say.

MS. SILVERSTEIN: I think we've been going about an hour, so this is a good time for a break.

A. Yeah. I'm going to grab some water.

THE VIDEOGRAPHER: We are off the record at 11:22 a.m.

(Recess taken, 11:22 a.m. to 11:29 a.m. PDT)

THE VIDEOGRAPHER: We are on the record at 11:29 a.m.

BY MS. SILVERSTEIN:

Q. Dr. Freeman, did you talk to anybody about the substance of your testimony during the break?

A. I didn't.

Q. For both your kidney cancer report and your Parkinson's Disease report, you reviewed 5 ATSDR studies, right?

A. Roughly.

Q. This includes the Bove 2014 Marine Mortality study, right?

A. Oh, publication by ATSDR. Sorry.

Yes, that is correct.

Q. It also includes the Bove 2014 Civilian Mortality study, right?

A. Yes.

Q. It includes the ATSDR 2018 Morbidity study, correct?

A. Yes.

Q. That includes the Bove 2024 Cancer Incidence study, right?

A. Yes.

Q. And the 5th is the Bove 2024 Mortality study, right?

A. Yes.

Q. These five studies all studied sample populations polled from the population of individuals at Camp Lejeune after 1975, right?

A. Yes.

Q. You also reviewed and discussed the 1997 ATSDR Public Health Assessment, right?

A. Yes.

Q. Are you aware that the 1997

Public Health Assessment was retracted?

A. I might be.

Q. Is it your general practice to rely on retracted studies?

A. It would not be my general practice to rely on retracted studies.

Q. Are you aware of why the 1997 Public Health Assessment was retracted?

A. Offhand, I don't recall.

Q. You also reviewed the 2009 report by the National Research Council titled: Contaminated Water Supplies At Camp Lejeune: Assessing Potential Health Effects.

Correct?

A. Yes.

Q. Do you generally consider the National Research Council to be reputable?

A. Yes. Just as I considered the ATSDR to be reputable.

Q. Did you consider the NRC's conclusion that the available scientific information doesn't provide a sufficient basis for determining whether the population at Camp Lejeune was suffering adverse health effects?

A. I did, as described in my report.

Q. And you're aware that NRC classified kidney cancer as having limited or suggestive evidence of an association, right?

A. That language sounds like the language that's in my report.

Q. Do you disagree with NRC's conclusion about kidney cancer?

A. If I was asked that question in 2009, I'd probably say no, but I'm being asked that question in 2025, and I have the advantage of an additional 16 years of information and evidence.

So because this is an evolving topic, and the information and science on the topic is evolving as well, what was true in 2009 as far as a consensus judgment has changed.

So yeah, at the time, I -- you know, if I looked at their same evidence, I may very well have come to the same conclusion.

Q. But today, you disagree with the NRC, correct?

A. Today I think that the 2009 NRC conclusion has been supplanted by new search that is described in my report.

Q. Are you aware that the NRC classified Parkinson's Disease as having inadequate or insufficient evidence to determine whether an association exists?

A. I believe that's also in my report.

Q. Do you disagree with the NRC?

A. I would give you the exact same answer and the rationale as I did with the kidney cancer which is to say that information has evolved and supplanted the information in 2009, and if I was looking at the same evidence that the NRC was in 2009, I may very well have come to the same conclusion.

Q. But you'd agree that today you disagree with the NRC, correct?

MR. SNIDOW: Objection to form, asked and answered.

A. I would say that the evidence has demonstrated that the NRC's position in 2009 has been supplanted by new evidence and

evolved in positions by other agencies.
BY MS. SILVERSTEIN:
Q. Dr. Freeman, you'd agree that age is the most important risk factor for Parkinson's Disease, correct?
A. Yes.
Q. You'd agree that the incidence and prevalence of Parkinson's steadily rises in adults beginning in the 5th decade, right?
A. Yes.
Q. A family history of Parkinson's and a first-degree relative is associated with a 2 to 3 fold increase in the risk of Parkinson's, right?
A. Yes, that sounds about right.
Q. Exposure to pesticides is a risk factor for Parkinson's, right?
A. Yes.
Q. Exposure to air pollution is a risk factor for Parkinson's?
A. Yes.
Q. High consumption of dairy products is a risk factor for Parkinson's, right?
A. Maybe.

Q. Living in an urban or industrial area with high release of copper, manganese or lead is a risk factor for Parkinson's right?

A. I'd have to look at that evidence, but it's reasonable. It's an environmental cause.

Q. Looking in rural areas can be a risk factor for Parkinson's?

A. Depends on which rural area you live in.

Q. Farming or agriculture work is a risk factor to Parkinson's, correct?

A. That may be a proxy for pesticide exposure, so yes.

Q. Use of well water is a risk factor for Parkinson's, right?

A. I would have to look at the evidence to be able to answer that question.

Q. Do you want to go ahead and turn to page 27 of your report?

A. Exhibit 3?

Q. Are you on page 27?

A. I am.

Q. And do you see the paragraph, I

guess, that says: Many environmental exposures have been identified as risk factors for PD and epidemiologic studies?

A. Yes.

Q. And the third from the bottom there is the use of well water, right?

A. I see that.

Q. You agree that high dietary intake of iron is a risk factor for Parkinson's Disease?

A. No. Again, the issue here is these are examples that have been described as potential risk factors. I don't know that it is a risk factor. They've just been described in the literature as potentially being risk factors.

Q. So you listed these risk factors in your report as having been identified as risk factors for Parkinson's Disease but don't have an opinion on whether or not they could be risk factors for Parkinson's Disease?

A. Right. I haven't evaluated that evidence.

Q. Is there other information that

you've provided in your Parkinson's Disease report that you haven't evaluated and has not been -- cannot tell us the accuracy of?

MR. SNIDOW: Objection, form.

A. You're asking me about the validity of the statement that well water, for example, is a risk factor for Parkinson's. That's just an example of what's been identified. I can't tell you about the -- how good that evidence is. It's just been identified as a risk factor. I'm not identifying it as being a validator risk factor or what that level of evidence is for it.

BY MS. SILVERSTEIN:

Q. Are there other -- is there other information in your Parkinson's Disease report that you can not tell us the validity of?

A. Well, it's a long report, and some of the information that I have is just repeated from other sources, like, when we started the deposition you asked me where I got some of my history, historical information. And I can't tell you that I

know the validity of that historical information.

Q. So would it be fair to say that there's information contained in your expert reports that may or may not be valid?

MR. SNIDOW: Objection to form.

A. No, it's valid for what it's represented as. I understand the history of Camp Lejeune to be what I've put down, what -- if it's -- in my report.

Whether or not there may be conflict or someone else has done more investigation is not something I'm addressing. So if somebody showed me evidence and said, well, actually, this statement is not quite correct, because somebody else found something else and this is the investigation they did, I don't have a basis to disagree with that necessarily.

Same thing here. I'm just giving a list of various risk factors that have been identified, but have -- I don't have any information on the validity of them. I -- this report is on the validity of Camp Lejeune exposure as a risk factor for causing

Parkinson's Disease or increasing the risk of Parkinson's Disease. That's the evidence that I've evaluated for validity. But I'm not looking at the underlying evidence for the validity of a broad statement about risk factors that have been identified or described in the literature at some point in time.

BY MS. SILVERSTEIN:

Q. Okay. Are you aware that constipation has been identified as a risk factor for Parkinson's?

A. I have -- I have it listed under another risk factor that is identified, but which is almost certainly heavily confounded.

Q. So that's a yes, you're aware that constipation has been identified as a risk factor, right?

A. It's been described as a risk factor. It's almost certainly a confounded -- a confounded risk factor, however.

That's just a multifactorial. It's just another term that has been -- or

another risk factor that has been enumerated, but as far as the validation of it using carefully controlled studies is something that I can't comment on.

Q. I'm asking if you're aware that it's been identified as a risk factor. And you say in your report: Among the most consistently identified risk factors are.

And you list constipation, right?

MR. SNIDOW: Objection to form. Asked and answered.

A. I can't tell you whether it's a true risk factor, I can just tell you it's been identified as one.

BY MS. SILVERSTEIN:

Q. And you're also aware that depression has been identified as a risk factor, right?

A. That is also on the list that's on page 27.

Q. So you are aware that it's been identified as a risk factor?

A. Yes, to the same -- with the same caveats that go with all of the other

risk factors that are identified.

Q. You are aware that excess body weight and metabolic syndrome have been identified as risk factors for Parkinson's, correct?

A. That is also on the list, and, yes, that has also been identified somewhere in the literature.

Q. You are aware that Type II diabetes has been identified as a risk factor, correct?

A. Yes, it is also on the list of identified risk factors.

Q. You are aware that history of traumatic brain injury has been identified as a risk factor for Parkinson's Disease, right?

A. Yes, and that actually is a validated association.

Q. You'd agree that for kidney cancer, there are several hereditary syndromes that are risk factors, right?

A. Yes.

Q. You'd also agree that for kidney cancer, smoking is a risk factor, right?

A. Yes.
Q. And you'd agree that for kidney cancer, obesity is a risk factor, right?
A. I'd have to go back to my report and see if that was listed. If you're reading from my report, then I'd kind of disagree, but I'd have to look at it if you want to direct me toward that page.
Q. So sitting here today, you don't remember whether obesity has been identified as a risk factor --
A. I have not --
Q. -- is that fair?
A. -- committed the entire report to memory, no.
Q. Are you aware that hypertension has been identified as a risk factor for kidney cancer?
A. Yes, that is a validated risk factor.
Q. And are you aware that prolonged ingestion of analgesic combinations has been identified as a risk factor for kidney cancer?
A. Yes, also validated.

Q. And are you aware that hepatitis C infection has been identified as a risk factor to kidney cancer.

A. I don't recall the background for that one. I'd have to look -- if it's in my report, it would be to the extent that I describe it. I just can't tell you that I know much about it.

Q. Okay.

If you want to go to page 30 of your report.

A. Exhibit 2?

Q. Correct.

Are you on page 30?

A. I am.

Q. The second paragraph on page 30 says: Sporadic, non-hereditary cases account for the majority of RCC. Several risk factors have been associated with sporadic RCC including exposure to toxic compounds, smoking, obesity, hypertension, prolonged ingestion of analgesic combinations, cytotoxic chemotherapy, chronic hepatitis C infection, kidney stones, acquired cystic disease of the kidney, and chronic kidney

disease.

Correct?

A. Yes.

Q. And the next paragraph says: Cigarette smoking is associated with an increased risk of developing RCC.

Correct?

A. Yes. That's a validated --

Q. And when you say RCC, you --

A. -- association.

Q. I'm sorry, I didn't mean to cut you off.

What were you saying about smoking?

A. That's a validated association.

Q. When you say RCC, you're referring to renal cell carcinoma, right?

A. I am.

(Freeman Deposition Exhibit 6, Evaluation of mortality among marines and navy personnel exposed to contaminated drinking water at USMC bases Camp Lejeune: A retrospective cohort study (Bove/Ruckart/Maslia/Larson),

CLJA_HEALTHEFFECTS-0000141103-000014115, was marked for identification.)

BY MS. SILVERSTEIN:

Q. This is the 2014 mortality study.

MR. SNIDOW: Okay.

MS. PLATT: Would you like me to upload you a copy?

MR. SNIDOW: No.

You said Marine, right?

MS. SILVERSTEIN: Yeah, Marine.

BY MS. SILVERSTEIN:

Q. Dr. Freeman, you were handed Exhibit 6, which is titled: Evaluation of mortality among marines and navy personnel exposed to contaminated drinking water at USMS Base Camp Lejeune: A retrospective cohort study.

Correct?

A. Yes.

Q. And this is a publication by: Bove et al. from 2014.

Right?

A. Yes.

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

A. I'm aware of the exposure misclassification issues. I can't tell you that I -- I don't believe I have his testimony.

Q. But you are aware of the misclassification issues in the study?

A. The potential for them, yes.

Q. And are you aware that the study had very little information on where Marines were barracked?

A. Yes, I am aware of that fact.

Q. And of the information that the investigators did have on where Marines were barracked, came from Marine -- individual Marine's memory. Are you aware of that?

A. I would assume that was correct, rather than from records that were reviewed, but I don't recall that offhand, no.

Q. If you turn to page 13 of the study.

MR. SNIDOW: Internal 13?

MS. SILVERSTEIN: Yes, it should be the same on the PDF and -- but the document number page 13, either way.

MR. SNIDOW: Great.

BY MS. SILVERSTEIN:

Q. If you look at the conclusion section the study concluded that: The precision of many hazard ratio estimates was low as indicated by wide confidence intervals.

Right?

A. Yes.

Q. You can go ahead and turn to page 7.

A. I'm there.

Q. Page 7 has Table 4, which is titled: Standardized mortality ratios, underlying cause of death.

Do you see that?

A. Yes.

Q. This study found that the standardized mortality ratio for kidney cancer was 1.16, correct?

A. Yes.

Q. The confidence interval for that finding is 0.84 to 1.57, correct?
A. Yes.
Q. Which means the confidence interval includes 1?
A. Yes. By definition.
Q. Which means it's not statistically significant, right?
A. Not at the 99% confidence interval.
Q. At the bottom of Table 4, below Table 4, it says: Not evaluated due to small numbers were Parkinson's Disease and male breast cancer.
A. Yes.
Q. Turn to page 10.
Are you on page 10?
A. I am there.
Q. Do you see Table 7?
A. I do.
Q. Table 7 is titled: Hazard ratios (95% confidence interval) for categorical cumulative exposure, and coefficients (95% confidence interval) for continuous cumulative exposure.

Do you see that?
A. Yes.
Q. The hazard ratio here is shown only -- for kidney cancer is shown for PCE and total volatile organic compounds, right?
A. Yes.
Q. For total volatile organic compounds, the high exposure hazard ratio is 1.54, right?
A. Yes.
Q. The confidence interval for that is 0.63 to 3.75, right?
A. Yes.
Q. Which means the confidence interval includes one? Right?
A. It does.
Q. And at the 95% confidence interval, that finding isn't statistically significant, correct?
A. Correct.
Q. And for PCE, there is not a monotonic dose-response relationship, correct?
A. There is between a low and high, but across low, medium, and high, that

is not demonstrated by the point estimates.
Q. The Marine mortality study didn't take into account whether participants had a traumatic brain injury, did it?
MR. SNIDOW: Objection to form.
A. I don't recall offhand.
BY MS. SILVERSTEIN:
Q. Are you aware of whether the Marine mortality study took into account whether participants had exposure to pesticides?
MR. SNIDOW: Objection to form.
A. I don't recall offhand.
BY MS. SILVERSTEIN:
Q. Are you aware of whether the Marine mortality study took into account whether participants drank well water?
A. I have to give you the same answer, I don't recall offhand.
Q. And you don't recall whether the study considered if participants had a history of constipation or depression?
A. I have to back up to my last answer, because I think that if you were at Camp Lejeune, you drank well water. And that

was the source of the -- I mean, those are the considered wells, I believe.

I think your question is more: Do you drink from well water that's on your own property? I mean; is that what you're intending?

Q. Did the study take into account whether or not participants grew up drinking well water?

MR. SNIDOW: Objection to form.

A. Again, if it's well water from -- they described as different wells within Camp Lejeune, I think that the implication there is that the water source is from the wells in Camp Lejeune. So it's not a super direct answer for you.

BY MS. SILVERSTEIN:

Q. Dr. Freeman, you'd agree that the Marine mortality study was evaluating Marines at Camp Lejeune, correct?

A. Yes.

Q. And Marines are adults?

A. Yes.

Q. So the study is not evaluating what kind of water those Marines drank as

children, correct?

A. That's true.

Q. And it didn't consider whether or not they grew up drinking from well water on their property, right?

A. I don't recall that specifically. I wouldn't be surprised if that wasn't considered, however.

Q. And to the best of your recollection, the study didn't take into account whether participants had hereditary syndrome like Von Hippel-Lindau syndrome, correct?

A. That's with two Ps.

That's correct.

(Freeman Deposition Exhibit 7, Mortality study of civilian employees exposed to contaminated drinking water at USMC Base Camp Lejeune: A retrospective cohort study (Bove/Ruckart/Maslia/Larson), CLJA_HEALTHEFFECTS-0000291324 through CLJA_HEALTHEFFECTS-0000291336, was marked for identification.)

BY MS. SILVERSTEIN:

Q. Dr. Freeman, you were just handed Exhibit 7, which is titled: Mortality study of civilian employees exposed to contaminated drinking water at USMC Base Camp Lejeune: A retrospective cohort study.

Correct?

A. Yes.

Q. And this is a 2014 study by Bove, et al., right?

A. Yes.

Q. Are you aware of the misclassification bias in this study?

MR. SNIDOW: Objection to form.

A. The potential for misclassification bias, as far as the source of the water, I think, is what you're referencing?

And yes, I'm aware of that in all of the studies that looked at a comparison of Camp Lejeune to Camp Pendleton.

BY MS. SILVERSTEIN:

Q. Are you aware that this study lacked data on the civilian employee participants' water use?

A. Yes.
Q. And are you aware that some of the workers may not have used Camp Lejeune water at all?
A. Yes. All with bias toward the null.
Q. If you go ahead and turn to page 7.
(Clarification by reporter.)
BY MS. SILVERSTEIN:
Q. Are you on page 7?
A. I am.
Q. Do you see Table 3: Standardized Mortality Ratios (SMRs), Underlying cause of death?
A. Yes.
Q. You'd agree that the SMR for kidney cancer is -- at Camp Lejeune is 1.3, correct?
A. Yes.
Q. And you'd agree that the confidence interval is 0.52 to 2.67, right?
A. I agree.
Q. Which means it includes 1, right?

A. I agree.
Q. Which means that the 95% -- at the 95% confidence interval, the results for kidney cancer are not statistically significant, correct?
A. I agree.
Q. Below that table, the authors discuss diseases of secondary interest. Do you see that?
A. Within the same table.
Q. Do you see the paragraph below the table that says: Diseases of Secondary Interest?
A. Oh, yeah. But also it's in the same table. You threw me off.
Q. And in that paragraph below the table, the authors discuss Parkinson's Disease, right?
A. They do.
Q. And you'd agree that the hazard ratio for Parkinson's Disease listed there is 3.13?
A. Yes.
Q. With a 95% confidence interval of 0.76 to 12.86, correct?

A. Yes.
Q. Which means that at the 95% confidence interval, that result is not statistically significant, correct?
A. I agree.
Q. In the table under diseases of secondary interest, they also provide the SMR for Parkinson's Disease, correct?
A. Yes, at the bottom.
Q. And at Camp Lejeune, the SMR is 2.28, right?
A. I am seeing 2.19.
You're looking at the expected.
Q. You're right. Thank you.
The SMR is 2.19, correct?
A. Yes.
Q. And the confidence interval is 7.1 to 5.11, right?
A. Yes.
Q. Which means that the 95% confidence interval, that result is not statistically significant, correct?
A. I can't argue with that logic, yes.
Q. And then if you turn to page 8,

Table 4.

Are you on page 8?

A. I am.

Q. And Table 4 is: Camp Lejeune vs Camp Pendleton: Hazard ratios and 95% confidence intervals, adjusted by sex, race, occupation (blue collar vs white collar) and education, 10-year lag.

Correct?

A. Yes.

Q. You'd agree that Table 4 shows the hazard ratio for kidney cancer to be 1.92, right?

A. Yes.

Q. And the 95% confidence interval for kidney cancer is 0.58 to 6.34, correct?

A. Yes.

Q. Which means that at the 95% confidence interval, that finding for kidney cancer is not statistically significant, right?

A. Yes.

Q. The p-value for kidney cancer is 0.28, correct?

A. Yes.

Q. Which is also not statistically significant, right?
A. At a p-value set at .05, yes.
Q. It's also not statistically significant at a p-value of .1, right?
A. Yes. That means it's almost 1 in 3 chance that the effects are due to random error, or random scatter.
Q. The hazards ratio in Table 4 for Parkinson's Disease is 3.13, correct?
A. Yes.
Q. And the 95% confidence interval is 0.76 to 12.86, right?
MR. SNIDOW: Asked and answered, but...
A. Yes.
BY MS. SILVERSTEIN:
Q. Which means that finding reported in Table 4 is not statistically significant, right?
A. Yes.
Q. The p-value for Parkinson's in Table 4 is 0.11, right?
A. Yes.
Q. Which means that it's not

statistically significant at the 0.05 level, correct?

A. Agreed.

Q. Or at the 0.1 level, correct?

A. Agreed.

Q. And, Dr. Freeman, you are aware that Camp Pendleton is a Superfund site, right?

A. Yes.

Q. And are you aware that the EPA has stated that chemicals of concern at Camp Pendleton include TCE?

A. Yes.

Q. You're not aware of the levels of contamination at Camp Pendleton, correct?

A. I haven't studied it, no.

Q. And so you didn't consider the levels of contaminants at Camp Pendleton when interpreting the Bove 2014 civilian mortality study rate?

A. That's not quite correct, no.

Q. How is that not correct?

A. That it's -- it's -- that it's incorrect.

Q. Did you consider the levels of

contaminants when evaluating the civilian mortality study?

A. Well, I considered that there are contaminants at Camp Pendleton, which would bias the results toward the null, between the two sites. Therefore, it dilutes the difference between the two sites.

Q. Directing you back to my question. You didn't consider the level of contaminant at Camp Pendleton, did you?

A. You're using "level" differently than I would use it.

The level is different than it would be from the SMR. For example, the base rate that is in the general population. That is Camp Pendleton would have a higher level of contamination and be expected for the general population.

So to that extent, yes, it's expected that they have a higher level of contamination than the general population, but knowing the specific level, I don't have that information.

Q. And you don't know for example whether Camp Pendleton had higher amounts of

TCE than Camp Lejeune did, do you?

A. I've not evaluated that issue at all, no.

Q. Can you turn to page 10?

Do you see Table 6?

A. I do.

Q. Table 6 is titled: Hazard ratios (95% confidence interval) for a categorized (less than median reference more than or equal to median) maximum cumulative exposure and coefficients (95% confidence interval) for continuous cumulative exposure (in micrograms per liter year).

Correct?

A. Yes.

Q. The hazard ratio for kidney cancer for the total volatile organic compound is 4.44, correct?

A. Yes.

Q. And the confidence interval is 0.52 to 38.19, correct?

A. Yes.

Q. Would you agree that that's a wide confidence interval?

A. I would.

Q. And it's not statistically significant at the 95% confidence interval, correct?
A. I agree.
Q. For kidney cancer and benzene, the hazard ratio is 1.82, correct?
A. Yes.
Q. And the confidence interval is 0.34 to 9.78, right?
A. Correct.
Q. Do you consider that a wide confidence interval?
A. That's pretty wide, yeah.
Q. And you would agree that, at the 95% confidence interval, the reported result for kidney cancer and benzene in Table 6 is not statistically significant, right?
A. I agree.
Q. Of the entire Camp Lejeune cohort 4,647 people, only seven had kidney cancer, correct?
A. Yes.
Q. And would you agree that there was not enough information to calculate the

finding -- the hazard ratio for PCE, TCE and vinyl chloride?

A. Yes.

Q. For Parkinson's Disease, out of a Camp Lejeune cohort of 4,647 people only five had Parkinson's, correct?

A. Yes.

Q. And for PCE, and Parkinson's disease, the hazard ratio is 2.68, right?

A. Yes.

Q. And the confidence interval is 0.22 to 33.28, right?

A. Yes.

Q. That's a wide confidence interval, right?

A. It is.

Q. And at the 95% confidence interval, the finding for PCE and Parkinson's Disease is not statistically significant, right?

A. Yes, that's correct.

Q. For Parkinson's Disease and TCE, the hazard ratio is 2.51, right?

A. Yes.

Q. The confidence interval is 0.21

to 30.76, correct?
A. Correct.
Q. And that's again a wide confidence interval, right?
A. Yes.
Q. And at the 95% confidence interval, that is not statistically significant, correct?
A. Correct.
Q. For vinyl chloride, the hazard ratio is 2.81, right?
A. Yes.
Q. And the confidence interval is 0.23 to 34.11?
A. Yes.
Q. Which means that it is not statistically significant, correct?
A. At the 95% confidence interval, correct.
Q. For TVOC, the hazard ratio is 2.52, correct?
A. Yes.
Q. And the confidence interval is 0.21 to 30.83, right?
A. Yes.

Q. Which is a wide confidence interval, right?
A. Yes.
Q. And it includes, at the 95% confidence interval level, it's not statistically significant, right?
A. For the greater the median exposure, yes.
Q. To the best of your recollection, the civilian morality study didn't take into account whatever participants had a traumatic brain injury, correct?
A. Your -- your knowledge of that detail is better than mine. I don't recall that offhand.
Q. You don't recall whether they took into account traumatic brain injury?
A. Not offhand.
Q. And you don't recall whether the civilian mortality study took into account whether participants grew up drinking from on-property well water, right?
A. Now that we've established what that is, no, I don't recall having a

recollection of them looking at childhood exposure to well water.

Q. And you don't recall whether participants had a history -- whether the study took into account whether the participants had a history of constipation or depression, right?

A. That's correct.

Q. And you don't recall whether the study took into account whether participants had a hereditary syndrome like Von Hippel-Lindau syndrome, right?

A. Also true.

Q. You don't recall whether the study took into account where the participants will be, right?

A. I don't have a recollection of that specifically, I agree.

Q. You can go ahead and set the civilian mortality study to the side.

(Freeman Deposition Exhibit 8, April 2018 Morbidity Study of Former Marines, Employees, and Dependents Potentially Exposed to Contaminated Drinking Water at U.S. Marine Corps

Base Camp Lejeune,
CLJA_HEALTHEFFECTS-0000000214 through
CLJA_HEALTHEFFECTS-0000000340, was
marked for identification.)

BY MS. SILVERSTEIN:

Q. Dr. Freeman, you were just handed Exhibit 8, which is titled: Morbidity Study of Former Marines, Employees, and Dependents Potentially Exposed to Contaminated Drinking Water at U.S. Marine Corps Base Camp Lejeune.

Correct?

A. Yes.

Q. And this is an ATSDR study from April of 2018, right?

A. Yes.

Q. And this is something that you reviewed when preparing your reports?

A. It is.

Q. If you can go ahead and turn to page 54.

A. Okay.

Q. Do you see the heading on page 54 that says: Limitations?

A. Yes.

Q. Under the heading Limitations, it says: The study has several major limitations. Surveys could not be sent to 20% of the cohort due to lack of complete and accurate addresses for mailing a survey. Additionally, some of the surveys coded as "not returned" likely did not reach the intended recipient.

Correct?

A. Correct that it says that?

Q. Is that what it says?

A. That is what it says.

Q. And go ahead and turn to page 55.

The last sentence on that first partial paragraph, it says: Nevertheless, selection biases are still a concern because of the low participation rate and past media coverage.

Did I read that correctly?

A. Yes.

Q. The next paragraph says that: About 50% of Marines and 40% of civilian employees did not complete a HIPAA form to allow for medical confirmation which reduced

the precision of the odds ratio estimates.

Did I read that correctly?

A. Yes.

Q. And it says: In the categorical analyses, there were small numbers of cases for some of the diseases and the exposure categories, especially for civilian employees. Therefore, confidence intervals were wide and these results need to be interpreted cautiously.

Correct?

A. Yes.

Q. ATSDR 2018 also identifies several sources of exposure misclassification, right?

A. Yes.

Q. And you are aware that there were uncertainties and variabilities concerning the amount of water each individual consumed, right?

A. Yes.

Q. You're aware that the study: Assumed that all civilian employees worked on mainside and were served by the Hadnot Point drinking water system and all civilian

employees consumed drinking water while on base.

Right?

A. Where are you reading from?

MR. SNIDOW: Do you want me to show him?

MS. SILVERSTEIN: Sure.

MR. SNIDOW: 56, down like about 1, 2, 3 -- 9 or 10 up from the bottom. Down a little bit.

There you go.

A. Oh, up from the bottom.

MR. SNIDOW: Yep.

A. Not down from the top. Got it. Yes, I now see where you are.

BY MS. SILVERSTEIN:

Q. And so you're aware that the study assumed that civilian employees worked on mainside and were served by Hadnot Point water system and that civilian employees consumed drinking water on base, right?

A. Yes. Well, I am now.

Q. And are you aware that civilian employees may have worked on parts of base that were not served by the Hadnot Point

drinking water system?

A. That seems to be suggested by the statement, yes.

Q. Did you consider these limitations when evaluating the 2018 study?

A. Particularly in this classification, yes. This is all bias toward the null.

Q. Go ahead and turn to page 10.

A. I am there.

Q. The last full paragraph on page -- or sorry, the last paragraph on page 10, the last full sentence starts: However.

Do you see where that is?

A. Yes.

Q. And it says: However, results of this study need to be interpreted with caution for several reasons. First, the low response rate and small numbers for some of the diseases of interest resulted in wide confidence interval.

Right?

A. Yes.

Q. And the bottom of that

paragraph says: The Camp Lejeune participants with health problems may have been more likely to participate because they were aware of the contaminated drinking water and believed they were affected by their exposures.

Do you see that?

A. Yes.

Q. That would represent a selection bias, correct?

A. A potential selection bias, yes.

Q. Are you aware that this 2018 study was not peer-reviewed?

A. Not offhand, no.

Q. Would you generally consider it your practice to include non-peer-reviewed studies in your epidemiologic analyses?

A. A regulatory agency, typically, yes. I mean, however, their internal processes function. I would consider what the regulatory agency -- what they had said about a particular topic in a particular report.

Q. So you'd consider that

whether -- even if it's not been peer-reviewed?

A. Well sure. I mean, it's whatever their processes are, would be something that I would -- if I was asked about it I could certainly examine. But the processes very well may be more stringent than typical peer review. It just depends on the agency and how they evaluate the publications that they put out.

Q. And you're not aware of how ATSDR evaluated this 2018 study, are you?

A. Not offhand, no.

Q. And it's not something that you considered when determining how much weight to give the study, is it?

A. No, and I don't think I weighted it particularly one way or the other.

Q. It's not something you considered when deciding whether or not this study was reliable?

A. Whether it was peer-reviewed?

Q. What the internal review process was?

A. No. That's ATSDR's business, not mine.

Q. Okay. So it doesn't matter to you what kind of process articles undergo before publication?

MR. SNIDOW: Objection to form, misstates his testimony.

A. It is a publication from the ATSDR. They're given equal weight because it's from ATSDR. So it's -- it is what it is. It is an ATSDR publication.

BY MS. SILVERSTEIN:

Q. Okay. You can go ahead and set that study aside.

(Freeman Deposition Exhibit 9, Cancer Incidence among Marines and Navy Personnel and Civilian Workers Exposed to Industrial Solvents in Drinking Water at US Marine Corps Base Camp Lejeune: A Cohort Study (Bove/Greek/Gatiba/Kohler/Sherman/Shin /Bernstein), was marked for identification.)

BY MS. SILVERSTEIN:

Q. Actually, I think I handed you

the wrong copy.

MR. SNIDOW: Me or him?

MS. SILVERSTEIN: Him.

(Discussion off the record.)

BY MS. SILVERSTEIN:

Q. Dr. Freeman, I handed you the 2024 cancer incidence study, correct?

A. Yes.

Q. And this is one of the studies that you relied on in forming your conclusions, right?

A. Yes.

Q. And this study is for -- this is a publication regarding the cancer incidence of Marine and Naval personnel stationed at Camp Lejeune 1975 to 1985, right?

A. Yes.

Q. And are you aware that the cancer incidence study did not perform any statistical significance testing?

A. Are you referring to the study I'm looking at now?

Q. Yes.

A. I have 95% confidence intervals

on Table 3. I'm not sure what you're referring to.

Q. Okay. And you didn't review Dr. Bove's testimony regarding the cancer incidence study, correct?

A. Not that I recall, no.

Q. So you wouldn't be aware if Dr. Bove said that he didn't perform any confidence interval testing, right?

MR. SNIDOW: Objection to form.

BY MS. SILVERSTEIN:

Q. Specifically significant testings?

MR. SNIDOW: Objection to the form, the study speaks for itself.

A. I mean, I'm looking at values that provide degrees of statistical significance. I'm not sure what that -- what Dr. Bove was referring to.

BY MS. SILVERSTEIN:

Q. Okay. Would you want to consider what the author of the study said about the study when analyzing the information?

MR. SNIDOW: Object to form.

A. I would want to consider what was published. I mean, that's what the entire world sees. I mean, not many people actually see what he said about it.

BY MS. SILVERSTEIN:

Q. Okay. So you don't --

A. So --

Q. You don't care about what Dr. Bove said about the study?

MR. SNIDOW: Objection, misstates the testimony.

A. Well, I'm interested in what's been published. I mean that's what is accessible to me.

So I -- I don't know what Dr. Bove said, and I don't know what the meaning is of what he said. But what I can tell you is that I'm looking at tests of statistical significance that are throughout Table 3 and Table 4, and the other tables that I'm looking at. So I'm not sure what's being referenced.

Q. Put aside the statistical significance question.

Would you -- if Dr. Bove had

made statements about his work on the cancer incidence study, is that something that you would want to consider when determining how much to weigh on the cancer incidence study?

MR. SNIDOW: Objection to form.

A. I'd be interested to see what he had to say, but again, I have to rely on what's been put out to the world at large in a peer-reviewed journal article.

BY MS. SILVERSTEIN:

Q. You are aware that no individualized exposure assessment was performed for the cancer incidence study, correct?

A. Individualized to each individual in the study?

Q. Yes.

A. I can't answer that question off the top of my head. That makes sense. I don't think that such a thing would be feasible.

Q. Which creates the potential for misclassification bias based on how much water individuals consumed, correct?

A. Bias toward the null, yes.

Q. Go ahead and turn to Table 3.
A. Yes, that's what I'm looking at.
Q. Table 3 is the: Comparison of cancer outcomes at Camp Lejeune vs. Camp Pendleton, among the Marines/Navy personnel subgroup who began active duty and were stationed at either base between 1975 and 1985.
Correct?
A. Yes.
Q. You'd agree that the results for Table 3 don't provide any results prior to 1975, correct?
A. Yes.
Q. The adjusted hazard ratio for kidney cancer is 1.06, correct?
A. For kidney and renal pelvis, yes.
Q. Would you consider 1.06 to be an elevated incident?
A. Not at the level we're talking about for this sort of evidence.
Q. Okay. Would you consider it to show a positive association that could

potentially be causation?

MR. SNIDOW: Objection to form.

A. Potentially.

BY MS. SILVERSTEIN:

Q. Okay. And to the best of your recollection, did the cancer incidence study take into account whether participants had a hereditary syndrome like Von Hippel-Lindau syndrome?

A. I have no recollection of such a thing being examined in any of the studies that we've been talking about, including this one.

Q. Okay. We can go ahead and set that exhibit aside.

(Freeman Deposition Exhibit 10, Evaluation of mortality among Marines, Navy personnel, and civilian workers exposed to contaminated drinking water at USMC base Camp Lejeune: A cohort study, was marked for identification.)

BY MS. SILVERSTEIN:

Q. You were just handed Exhibit 10, which is the Bove 2024 mortality study, right?

A. Yes.
Q. For this study, no individualized exposure assessment was performed for participants, correct?
A. Yeah, I don't think that would be feasible, so, yes, I think I can agree with that offhand.
Q. Are you aware that the ATSDR water model wasn't used for either the 2024 Bove studies?
A. I'd have to go back and look at the studies to tell you whether that was something that was in the back of my mind.
Q. In the 2024 mortality study, the dose response analysis was based on duration on base, correct?
A. Hold on. I can look at the study that's in front of me or I can look at my report. But I do want to make sure that I look at it before I answer your question.
[Document review.]
A. It's not jumping out at me.
BY MS. SILVERSTEIN:
Q. So you're not aware of whether duration or contaminant ML was analyzed for

the dose-response?

MR. SNIDOW: Objection to form, and just for the record, the witness asked to be shown the part of the study or in his report that you're referring to.

A. As I sit here, I obviously have not memorized the studies. I'd have to look at something where I either referred to it in the report or the part of the study to be able to answer that question.

BY MS. SILVERSTEIN:

Q. So right now, you don't recall?

A. I don't recall specifically where that is stated, that's correct.

Q. Are you aware that estimated concentrations were not considered in analyzing dose-response?

A. I don't see any evidence that that was taken into account, so, yes, I would say I am aware of that.

Q. Okay. Did you review the supplemental tables to the 2024 mortality study?

A. Yes.

Q. Go ahead and turn to supplemental Table 6.

A. S6 or just 6?

Q. Yeah, S, Supplemental 6.

A. Okay.

Q. Table S6 is: Hazard ratios (HR) and 95% lower and upper confidence interval (CI) for the Marines/Navy personnel subgroup analysis of base duration between 1975 and 1985 at Camp Lejeune with Camp Pendleton as reference: Underlying cause of death.

Correct?

A. Yes.

Q. And you'd agree that for kidney cancer, the lower duration, medium duration and high duration actually shows an inverse dose-response relationship, right?

A. Yes.

Q. Which means that the lower duration hazard ratio is higher than the medium duration hazard ratio, right?

A. The point estimates, yes. None of them are statistically significant at the 95% confidence interval.

Q. And the medium duration hazard ratio is higher than the high duration hazard ratio at the point estimated, correct?

A. Yes.

Q. And if you turn to the next page, do you see Parkinson's Disease toward the bottom?

A. Yes.

Q. You'd agree that Parkinson's Disease does not -- that the high -- the hazard ratio for high duration exposure for Parkinson's Disease is lower than either the low duration exposure or the medium duration exposure at the point estimate, correct?

A. I agree.

Q. And to the best of your recollection, the 2024 mortality study didn't take into account whether participants had a history of traumatic brain injury, correct?

A. I don't have a recollection of whether or not that was evaluated. I certainly don't have a recollection that it was evaluated, however.

Q. And to the best of your recollection, the study didn't take into

account whether participants grew up drinking from well water on property, correct?

A. No, that's correct. Quite sure that was not accounted for.

Q. To the best of your recollection, the study didn't take into account whether participants had a history of constipation or depression, right?

A. Also true.

Q. To the best of your recollection, the study didn't take into account whether participants had hereditary syndrome like Von Hippel-Lindau syndrome, correct?

A. Also true.

Q. And it didn't take into account whether participants had a history of obesity, correct?

A. That one I can't offer a -- that one I cannot answer off the top of my head.

Q. You have no recollection as to whether or not the study took into account whether participants had a history of obesity, right?

A. That's correct, as I sit here I do not recall.

MS. SILVERSTEIN: Since we've been going about an hour, is this a good time to take a break.

THE VIDEOGRAPHER: We are off the record at 12:33.

(Recess taken, 12:33 p.m. to 1:36 p.m. PDT)

THE VIDEOGRAPHER: We are on the record at 1:36 p.m.

BY MS. SILVERSTEIN:

Q. Welcome back, Dr. Freeman.

During the break, did you talk to anybody about the substance of your testimony?

A. No, not really. I mostly talked about tacos.

Q. A great topic of conversation.

It looked like you were checking something on your personal laptop right at the start of the break; is that right?

A. Yes.

Q. What were you looking at?

A. Well, that is a personal question on my personal laptop.

I was checking my e-mail.

Q. Your personal e-mail?

A. To find out how many things I had missed. Yeah, I wasn't communicating with anybody about the case.

Q. And when checking your e-mail, did you review any e-mails about the Camp Lejeune litigation?

A. I had no discussions with anybody about any aspect of the case.

Q. Does that include that you didn't read any e-mails related to Camp Lejeune?

A. Same -- yes, all -- yeah, 0. I was just trying to find out how much stuff has stacked up while we were chatting.

Q. When you were reviewing your e-mail, did you review any e-mail about TCE, PCE, vinyl chloride or benzene?

A. No, Camp Lejeune has pretty much gotten all of my attention on those topics, and nobody has written to me about that.

Q. What about kidney cancer or Parkinson's Disease, did you review any e-mails about those two diseases?

A. No. I'm not that fast.

Q. All right. I want to talk now for a little bit about your kidney cancer report, which I think is Exhibit 2. Do your opinions about kidney cancer apply to both clear cell, renal cell carcinoma and papillary renal cell carcinoma?

A. Yes.

Q. Do you have any opinions that differ between those two types of renal cell carcinoma?

A. No. To the extent that they're studied under one collective term of kidney cancer, typically in the epidemiological literature, I consider them collectively.

Q. And if you had any opinions that differ between those two types of renal cell carcinoma, would you have specified that in your report?

A. Yes, and I discussed that literature in my report.

Q. Do your opinions regarding

kidney cancer apply to upper urinary tract urothelial cancer?

A. Yes.

Q. Are there any differences in your opinions on upper tract urothelial cancer and other renal cell carcinoma?

A. Not as far as the evidence for the environmental exposure to TCE, PCE, and benzene and vinyl chloride, no.

Q. Are you familiar with a confidence interval ratio? CIR?

A. Yeah, I am. I discussed that at some length in my report.

Q. And you calculated the CIRs in some of the tables in your report, right?

A. If it wasn't furnished, and it was appropriate, yes.

Q. Let's go ahead and look at Table 5 in your kidney cancer report.

A. Can you tell me the page that that's on?

Q. I can in just a second.

A. I turned to it immediately on page 33.

Q. That is extraordinary luck.

Did you calculate the CIRs in Table 5?

A. Yes.

Q. And these CIRs, then, aren't provided in the -- the ATSDR study, the Bove study, right?

A. For that particular study, that's correct.

Q. A confidence interval ratio is something thought up by Dr. Bove and his coauthors, right?

MR. SNIDOW: Object to form.

A. I'm not sure that's true.

BY MS. SILVERSTEIN:

Q. Have you seen discussion of the confidence interval ratio in other places in the literature?

A. Yes. Most certainly.

Q. Where?

A. I'd have to look at the literature to be able to tell you, but I've seen it in a number of other places.

Q. Okay. Can you think of any other location that you've seen discussion of CIRs?

A. Not without my laptop and being able to reference to some sort of documentation.

Q. So sitting here today, you can't think of any other locations?

A. I can't tell you out of my memory. I can tell you without doubt that there are a number of other publications that have discussed it, though. And it goes back before, I believe, Dr. Bove's discussion of it, as far as the timing of publication.

Q. Okay.

A. To the best of my recollection.

Q. Would you agree that an appropriate CIR level for precision has not been specified or validated in the literature?

A. I would say that it's like p-values, in confidence interval that a confidence interval ratio is also a -- just a construct and one that can not be validated. Or not readily validated.

So to that extent, yes.

Q. If on page 33 you look at the full paragraph above Table 5 that starts:

Steady investigators?

Do you see that paragraph?

A. Study investigators, yes.

Q. The last or second sentence in that paragraph says: Although an appropriate CIR level for precision has not been specified or validated in the literature, the authors consider CIRs of less than or greater than -- less than or equal to 3 to indicate reasonable precision of the adjusted hazard ratios?

Correct?

A. Yes.

Q. So you'd agree that an appropriate CIR level for precision has not been specified or validated in the literature, right?

A. Not generally, that's true, because it's not a term that's typically used.

Or measure, I should say, that's been typically used.

Q. You'd agree that the author's determination to use a CIR less than or equal to three isn't based on the scientific

consensus, right?

MR. SNIDOW: Objection to form.

A. When you say "scientific consensus," that's a very broad term. It's based on the scientific principle of the width of the confidence interval or some way to measure it in a very -- a very easy to identify form, with a cut off.

But as far as whether there are others who use it, which I guess you could say is a form of consensus, there are some others who have described using it. But is it -- I guess my answer is, it's not in general use. To my knowledge.

So to that extent, it doesn't have general use throughout the literature, the epidemiological literature.

Sorry, that's another bad answer, but it's hard to answer that question because some people use it, but most people don't.

BY MS. SILVERSTEIN:

Q. You'd agree that a determination that an appropriate CIR is less than or equal to three is an arbitrary

cutoff, right?

A. Yes, as are all cutoffs.

Q. Go ahead and turn to page 36 of your kidney cancer report.

(Clarification by reporter.)

BY MS. SILVERSTEIN:

Q. So page 36 is the start of your discussion on kidney cancer and TCE, right?

A. I'm sorry, page 36?

Q. Yes.

A. Yes. Yes, correct.

Q. And you cited three meta-analyses to support the proposition that meta-analyses -- three meta-analysis evaluated the association between TCE exposure and subsequent kidney cancer, right?

A. Yes.

Q. One of those studies is Kelsh 2010, right?

A. Yes.

(Freeman Deposition Exhibit 11, Occupational Trichloroethylene Exposure and Kidney Cancer, A Meta-analysis (Kelsh/Alexander/Mink/Mandel), was

marked for identification.)

BY MS. SILVERSTEIN:

Q. You were handed Exhibit 11, which is Kelsh 2010, correct?

A. Yes.

Q. And this is one of the studies that -- one of the meta-analyses that you relied on for your conclusion that TCE can cause kidney cancer, right?

A. That's one of the ones that I described in my report, yes.

Q. Did you rely on it?

A. Well, I think that what I relied on to come to the -- my ultimate conclusion is described in my Hill criteria analyses.

Q. Okay. You discuss Kelsh in your report, correct?

A. I did.

Q. If you could look at page 1 under: Conclusions.

Which is on the right-hand side.

A. Yes.

Q. Under conclusions, the authors

wrote: Positive associations were observed across various study groups. However, considerations of unmeasured potential confounding, lack of exposure response patterns, limit epidemiologic insight into the role of trichloroethylene exposure and its potential causal association to kidney cancer.

Correct?

A. Yes.

Q. The authors did not believe that there was enough evidence for epidemiologic insight into the role of TCE in kidney cancer, right?

A. That's what they claimed.

Q. Do you disagree with that piece of the author's conclusions?

A. I'm familiar with the authors and their modus operandi, which tends to be less public health protection and more on industry protection, so I'm not surprised to find that conclusion. But I still included it in my discussion of meta-analyses from the literature.

Q. I think my question was maybe a

little bit different. Do you agree with the authors that there's not sufficient epidemiologic data to draw a conclusion on TCE and kidney cancer based on this meta-analyses?

A. I didn't look at the study with that particular goal in mind to see if I could support their conclusions. As I said, I'm -- I'm a bit skeptical about the way they described their findings, because I'm familiar with how they've described other findings from an industry-based perspective rather than a public health protection perspective. So I wasn't looking to critique what they said, I was looking to describe what their findings were.

Q. And do you believe that the study supports a finding that there is epidemiologic evidence to support -- based on this study to show that TCE can cause kidney cancer?

A. Well, I think that there is good evidence TCE can and does cause kidney cancer. So this study's findings as -- or stands as an outlier compared to the other --

a lot of other literature.

But specifically what they described, and how they described it, I haven't looked at it with that particular goal in mind to find out whether or not I agree with their conclusions.

Q. You didn't look at Kelsh 2010 to determine whether it supported a finding that there is epidemiological evidence to show TCE causes kidney cancer?

A. I just described what their findings were. I didn't describe what their narrative conclusions were.

Q. And based on their findings, do you believe that the findings in Kelsh 2010 show that there is epidemiologic evidence to support a causal relationship between TCE and kidney cancer?

A. Well, as I describe in my report, when you take the specific studies, groups as they -- as the way they were grouped by the authors, you'll find that there are several findings of statistically significant increased risk, a strength of association is described that is

meta-analyzed.

As I described, that group one studies as described by these authors, found a 1.34 relative risk with a statistically significant confidence interval.

And their group two cohort did not. It was not statistically significant. But for the case control studies, again, it was statistically significant it was elevated.

So if you just look at the results of the -- part of their meta-analysis, it suggests that there's a relationship between TCE exposure and kidney cancer.

So the conclusions don't seem to be very congruent with what the findings were, and they are not consistent with what I would say is best practices for public health protection.

Q. Go ahead and turn to page 39 of your report.

A. Are you all done with this guy?

Q. For now, yeah.

On page 39, when discussing

dose-response, you identify two studies that were included in all three meta-analyses, right?

A. Yes.

Q. And one of those studies was Moore 2010, correct?

A. Yes.

(Freeman Deposition Exhibit 12, September 2011 Toxicological Review of Trichloroethylene, was marked for identification.)

BY MS. SILVERSTEIN:

Q. I handed you the EPA --

A. My exercise for the day? Is that what you mean to say?

Q. Yeah, your exercise for the day.

EPA's 2011 Toxicological Review of trichloroethylene.

Right?

A. Yes, you did.

Q. Are you familiar with this document?

A. Yes.

Q. If you go ahead and turn to

page 5-139.

I know.

And don't worry, I won't ask too many questions about this one.

A. Okay.

Q. Are you on page 5-139?

A. I am indeed.

Q. At the top of page 5-139 in Section 5.2.2, which is the: Dose-Response Analysis: Human Epidemiologic Data.

Right?

A. Yes.

Q. And in that section, about eight lines down, there's a sentence that begins: While.

Do you see that?

A. Yes.

Q. In EPA stated that: While the detailed approach used by Moore et al. (2010) should be fairly reliable for general rankings, the resulting estimates are not expected to be as quantitatively accurate as those in the Charbotel, et al. (2006).

Correct?

A. That it says that, yes.

Q. And then they selected Charbotel 2006 as the: Sole basis for the derivation of inhalation unit risk estimate for kidney cancer.

Correct?

A. Yes, it does say that.

Q. Are you familiar with the Charbotel study?

A. I can't remember if I cited it or not.

Q. Does it ring a bell sitting here today?

A. That's not going to be good enough. I mean, there are so many papers that I've cited, I couldn't tell you that I did or didn't cite it.

Q. Sure. Do you remember the Charbotel study at all?

A. No, there's so many studies that just the name isn't going to be very helpful for me.

Q. And as promised, you can go ahead and set that very large document aside.

(Freeman Deposition Exhibit 13, Case-Control Study on Renal Cell

Cancer and Occupational Exposure to Trichloroethylene Part II: Epidemiological Aspects (Charbotel/Fevotte/Hours/Martin/Bergeret), was marked for identification.)

A. Oh, there it is. Number 87.

BY MS. SILVERSTEIN:

Q. You were handed Exhibit 13, which is a document with the title: Case-Control Study on Renal Cell Cancer and Occupational Exposure to Trichloroethylene. Part II: Epidemiological Aspects.

Right?

A. Yes, that's number 87, cited, that I see right in front of me --

Q. So --

A. -- of my report.

Q. So you're familiar with the Charbotel 2006 study?

A. Well, I was when I wrote the report, yes.

Q. And you're aware, then, that Charbotel only found a statistically significant increase where the exposure was

335 parts per million year or more, right?
A. Offhand, no. Do you want to point me toward someplace...
Q. Sure. Go ahead --
A. That I should be looking at.
Q. You don't remember -- did you rely on Moore or Charbotel for your conclusion?
A. Well, to the extent they're described in my report, yes.
Q. Did you rely on both of them? On one or the other?
A. I'd have to go to the extent that they're described in the report, because of the size of the report and the complexity of it. I can't tell you that offhand.
Q. I'll go ahead and direct you to page 39 of your report.
A. Yes, I see that.
Q. And on page 39, you discuss Moore and associates -- Moore 2010, and their findings, correct?
A. Yes.
Q. You do not discuss Charbotel, correct?

A. Not in any kind of detail, no.
Q. Did you give more weight to Moore than to Charbotel?
A. I described Moore, but not in terms of more weight than Charbotel. I described Moore because of the detail in the Moore paper, so...
Q. What detail are you describing?
A. There was detail in Moore of exposures that was, as described in the EPA document, of a high level of -- a high level of detail. And so for that reason, I chose that to describe in my section on dose-response.
Q. When drafting your report, were you aware that EPA believed that Moore's dose-response was only reliable in terms of qualitative comparison between groups and not in terms of quantitative exposure?
MR. SNIDOW: Object to form.
A. I'd have to go back to exactly what the EPA said about Moore versus Charbotel to tell you whether I was aware of that. But at the time I drafted the report, I found Moore to be a good reference for

dose-response. And specifically where I categorize Charbotel in that hierarchy, I can't tell you.

BY MS. SILVERSTEIN:

Q. When you say Moore was a good study for dose-response, do you mean in terms of the actual amounts referenced in Moore or in terms of a qualitative assessment?

MR. SNIDOW: Objection to form.

A. Well, there's a quantitative assessment in order to rank the exposure levels, but not in terms of actual chemical values. Which is not terribly important, if qualitative -- their semi-quantitative analysis is perfectly legitimate for assessing dose-response.

BY MS. SILVERSTEIN:

Q. Did you consider the actual amounts discussed in Moore?

A. It's -- it is described in my report. To the extent it's described in my report, yes.

Q. And did you consider the actual amounts when forming your conclusions?

A. To the extent that my

conclusions include the incidents ratios, yes. But to basically take all of the information out of Moore, that wasn't the purpose of the report. The purpose of the report was to say there is support for dose-response in the literature. At least in this section of the report.

Q. Is your opinion that there's evidence of a dose-response at any amount of TCE, or does there need to be a certain amount of TCE that a person's exposed to before that relationship exists?

MR. SNIDOW: Objection to form.

A. I don't believe that evidence exists.

BY MS. SILVERSTEIN:

Q. Would it be right to say, then, that you don't know how much TCE someone needs to be exposed to for a causal relationship to potentially exist?

MR. SNIDOW: Objection, form, misstates.

A. It would be correct to say that I don't believe that anybody has that information that that sort of detail doesn't

exist.
BY MS. SILVERSTEIN:
Q. If you go ahead and look at the chart that you made on page 38 of your report.
A. Yes.
Q. You'd agree that all three meta-analyses discussed Charbotel, right?
A. Yes, that is correct.
Q. And you'd agree that all three meta-analyses also included Axelson, right?
A. Included -- I'm sorry, what was the name?
Q. Axelson.
A. I don't see -- I don't see where I describe where Axelson is listed in all three, so I can't agree with that.
Oh, no. There it is. On Table 9. Yes. I take it back. Yes. All three were included -- or all three meta-analyses included Axelson, and you are correct.
Q. And did you review Axelson?
A. Separately? I believe so, yes.
(Freeman Deposition Exhibit 14,

Updated and Expanded Swedish Cohort Study on Trichloroethylene and Cancer Risk (Axelson/Selden/ Andersson/Hogstedt), was marked for identification.)

MS. PLATT: Can I upload it for you?

MR. SNIDOW: Yeah, this one I will need.

MS. PLATT: Okay.

MR. SNIDOW: Thank you.

BY MS. SILVERSTEIN:

Q. You can go ahead and turn to page 556.

A. I will. Oh, 556 is the first page.

I didn't have to turn anything.

Q. Perfect.

And I'm looking at that italicized paragraph at the top of the -- right away in the article. Do you see --

A. The abstract? Yes.

Q. At the end of that paragraph, the authors wrote: It is concluded that this study provides no evidence that

trichloroethylene is a human carcinogen, i.e., when the exposure is as low as for this study population.

Right?

A. Yes.

Q. They concluded that their study didn't show evidence of TCE as a human carcinogen?

MR. SNIDOW: Object to form.

A. Yes.

BY MS. SILVERSTEIN:

Q. You can go ahead and set that article to the side.

And, Dr. Freeman, in your kidney cancer report, you didn't report -- in the TCE and kidney cancer section, you didn't report results for Garabrant 1988, right?

A. I have no idea.

MR. SNIDOW: Did you say 1988?

MS. SILVERSTEIN: Yes.

A. Let me take a look and see if I can answer your question.

MR. SNIDOW: Are you looking at the table on page 38?

A. Yeah, I'm looking at page 38.

[Document review.]

A. I'm not sure what the reason is why there isn't a relative risk there. It might not have been reported in the paper.

BY MS. SILVERSTEIN:

Q. Okay. And you didn't report it on your own, correct?

A. No, I'm not going to make up something for the paper that wasn't there.

Q. So you didn't review Garabrant 1988 to see what the results of the study were to report?

A. I don't remember.

Q. You didn't report results for Blair 1989?

A. Correct.

Q. You didn't report results for Ritz 1999, correct?

A. So, I'm sorry, what is it?

Q. Ritz.

A. R-I-T-Z?

Q. Yes.

It's on the bottom of page 37.

A. Oh, there it is.

No, those are not reported as

well.

Q. And in your kidney cancer report in the section on TCE and kidney cancer, you did not cite Michalek 2019, correct?

A. Would you give me the question one more time, please?

Q. In your kidney cancer report in the section on TCE and kidney cancer, you did not cite Michalek, M-I-C-H-A-L-E-K, 2019, correct?

A. I don't know that I can tell you the answer to that, because there are so many citations here. But I can look through it and see if I can find it.

Q. Every study that you cite, that you reviewed for your report is cited in your report, correct?

A. Yes.

Q. So if a study is not cited in your report it means that you did not consider it for your report?

A. I didn't describe it in the report, yeah.

Q. Are there studies that you

considered in forming your conclusions that you did not cite in your report?

A. No. I think you asked me that at the beginning of the deposition, and I said no. If I considered it, then it would be cited in the report, whether it was positive or negative.

Q. So if it's not cited in the report, you didn't consider it, correct?

A. Not arriving at the opinions that are in the report, that's correct.

Q. Go ahead and turn to page 45.

A. I am there.

Q. And do you see the section where you begin discussing PCE?

A. I do.

Q. Right under where it says "Epidemiologic studies," you wrote: In the analysis internal to the Camp Lejeune cohort of military personnel a nonmonotonic exposure-response trend was observed in the point estimates of the association between PCE and kidney cancer, meaning that the risk of kidney cancer increased with increasing levels of exposure.

Right?

A. Yes.

Q. A nonmonotonic exposure response trend means that there are results for a more duration or more exposure that are lower than a lower amount, correct?

A. Yes, typically.

Q. And if, for example, the point estimate for medium exposure is lower than the point estimate for low exposure, that does not demonstrate increasing levels of risk for the medium exposure as compared to the low exposure, right?

A. Correct.

Q. For that assertion that we were just discussing, you provide one citation, which is to the Bove Marine mortality study from 2014, correct?

A. Yes.

Q. And then you refer to Table 7, right?

A. Yes.

Q. If you turn to page 34. Page 34 has Table 7.

A. Sorry, the next page is

Figure 7. It threw me off.

I've got ya.

I'm on page 34, for Table 7, rather than the table or whatever the figure is on seven. That is Figure 7. Yes. Fire away.

Q. In Table 7, for PCE, you'd agree that the -- the adjusted hazard ratio for high exposure is actually lower than the adjusted hazard ratio for medium exposure, right?

A. Yes.

Q. Which means that those point estimates are showing that the risk of kidney cancer from PCE is less at high exposure than at medium exposure, right?

A. Yes, not statistically significantly lower, but it is lower, the point estimate.

Q. You'd agree that the results that you reported in Table 7 for PCE are not statistically significant at low exposure, medium exposure, or high exposure, correct?

A. Yes. As far as not meeting the 95% confidence interval by not crossing the

boundary of 1.0.

Q. You can go ahead and go back to page 45, please.

A. Okay.

Q. You'd agree that no meta-analysis have been conducted for PCE and kidney cancer, right?

A. That's my understanding, yes.

Q. Instead, you rely on the 2019 ATSDR toxicological profile for PCE on that summary of epidemiology studies, right?

A. Yes.

Q. You agree that the ATSDR 2019 tox profile summarized studies do not consistently observe increased risk, right?

A. I do agree with that.

Q. And only one study demonstrated elevated risk that was statistically significant, correct?

A. Correct.

Q. So instead, you looked to a meta-analyses about PCE and bladder cancer, right?

A. When you say "instead," you mean in addition? Right? Or am I -- am I

misinterpreting what you're saying?

Q. Instead of any meta-analyses on PCE and kidney cancer, you looked at a meta-analyses on PCE and bladder cancer, right?

A. Right, if there's nothing there, then I didn't look at that so I also included a -- the bladder cancer meta-analysis, correct.

Q. And you'd agree that bladder cancer and kidney cancer are different diseases, correct?

A. I do agree, yeah.

(Freeman Deposition Exhibit 15, Tetrachloroethylene Exposure and Bladder Cancer Risk: A Meta-Analysis of Dry-Cleaning-Worker Studies, was marked for identification.)

BY MS. SILVERSTEIN:

Q. You were handed Exhibit 15, which is Vlaanderen 2014, correct?

A. Yes.

Q. And is this the meta-analyses on PCE and bladder cancer that you reviewed when writing your kidney cancer report?

A. Yes, I believe that's the one that I referenced. Hold on a minute. Let me just make sure I'm finding it.

[Document review.]

A. Yes, that is correct.

BY MS. SILVERSTEIN:

Q. If you look on that first page in the blue box, do you see where it says: Results?

A. I do.

Q. And the authors wrote: The meta-relative risk (mRR) among tetrachloroethylene-exposed workers was 1.08. (95% confidence interval: 0.82 to 1.42; three studies, 463 exposed cases).

Correct?

A. Yes.

Q. And under conclusion, the authors acknowledge that dry cleaners incurred mixed exposures, right?

A. Yes.

Q. And you'd agree that the Vlaanderen 2014 study wasn't looking at renal cell carcinoma, right?

A. I do agree with that.

Q. And it wasn't specifically looking at transitional cell carcinoma either, was it?

A. No, it did not subdivide out the types of cancers.

Q. It was focused on bladder cancer, right?

A. Yes.

Q. Go ahead and turn to page 665.

It says 665 in the bottom right-hand corner.

A. I am there.

Q. And on page 665, the author said: Therefore, the higher risk of bladder cancer in dry cleaners may have been due to tetrachloroethylene exposure, the primary solvent used in dry cleaning. However, with limited evidence from studies that specifically assessed exposure to tetrachloroethylene, we're not able to corroborate this hypothesis.

Correct?

A. Yes, that is what it says.

Q. Go ahead and turn to page 51 of your report.

And you can set aside the Vlaanderen article.

A. All right.

I am there.

Q. Actually, if you go back to page 50 where it says: Number 1, Strength of association?

A. Yes.

Q. Under strength of association, you only discuss one study specifically to PCE and kidney cancer, right?

[Document review.]

A. That's correct.

BY MS. SILVERSTEIN:

Q. And then at the top of page 51, you discuss Vlaanderen under strength of association, right?

A. Yes.

Q. Okay. And you say: Using an analysis of bladder cancer epidemiology in the meta-analysis by Vlaanderen and coworkers, the association found between PCE and bladder cancer can be extended to urothelial carcinoma of the renal pelvic.

Correct?

A. Yes.
Q. You don't say that you're extending it to renal cell carcinoma, do you?
A. No. That's a different kind of cancer.
Q. Would you agree that -- well, let me say it this way instead.
In your analysis of PCE and kidney cancer, when you discussed Vlaanderen, did your discussion apply just to urothelial carcinoma of the renal pelvis or does that discussion also apply to renal cell carcinoma?
A. No, it is specifically to urothelial cell carcinoma.
Q. Okay. And you'd agree that for consistency, when looking at studies specifically to PCE and kidney cancer, consistency is not met, correct?
MR. SNIDOW: Objection to form.
A. PCE and kidney cancer -- yes, I do agree with that.
BY MS. SILVERSTEIN:
Q. And for your PCE and kidney cancer section, if you considered a study,

you would have cited that study in your report, right?

A. Yes, that is correct. That hasn't changed.

Q. If we can go ahead and turn to page 52.

Do you see the section on page 52 that -- the header is: Vinyl chloride?

A. I do.

Q. On page 52, you say that: In the analysis internal to the Camp Lejeune cohort of military personnel with follow-up between 1979 and 2008, a nonmonotonic exposure-response trend was observed for vinyl chloride and kidney cancer.

Right?

A. Yes.

Q. And then that last sentence, you have: Compared to those with no exposure to vinyl chloride, the hazard ratios for the low, medium, and high exposure categories were, 1.66, 1.61 and 1.51, respectively.

Right?

A. Yes.

Q. And you'd agree that that

represents an inverse dose-response trend, right?

A. I don't have the confidence intervals that are listed here. So I would say it's probably -- it's -- there probably aren't significant differences between the groups, because they all are pretty close. So it probably just represents about the same across the board. I wouldn't say it's a downward trend.

Q. You'd agree that 1.66 is higher than 1.61, right?

A. Mathematically, I can't argue with that.

Q. And 1.61 is higher than 1.51?

A. I would also agree.

Q. Which means, in terms of lowest hazard ratio to highest hazard ratio, it's actually the high exposure category that has the lowest hazard ratio, and the lowest exposure category that has the highest hazard ratio, right?

A. Yes. Also can't disagree with that.

Q. All right. You then go on to

discuss the development of cancer in humans as a result of vinyl chloride exposure, right?

A. Sorry, looking for a table. I'm sorry, give that to me one more time, please.

Q. You discuss the development of cancer in humans as a result of vinyl chloride exposure, right?

A. Yes, on the same page, page 52.

Q. And you talk about IARC's 2008 monograph for vinyl chloride in humans, right? And cancer risk?

A. Yes.

MR. SNIDOW: Is that the monograph?

MS. SILVERSTEIN: Yeah.

MR. SNIDOW: The whole thing?

MS. SILVERSTEIN: Yeah. This is the tox profile, the ATSDR tox profile. My apologies.

MR. SNIDOW: No problem.

(Freeman Deposition Exhibit 16, January 2024 Toxicological Profile for Vinyl Chloride, was marked for

identification.)

MS. PLATT: Can I send you this one?

MR. SNIDOW: I've got this one. Thank you, though.

BY MS. SILVERSTEIN:

Q. You also cite the toxicological profile for vinyl chloride from the ATSDR, correct?

A. I do.

Q. And the document I just handed you is that ATSDR tox profile for vinyl chloride, right?

A. It certainly appears to be so, yes.

Q. And since you cited this, this is a document that you're familiar with, right?

A. Well, I mean, I've reviewed it. I can't say I've memorized it.

Q. Sure. This isn't the first time that you're seeing this tox profile, right?

A. That is certainly true, yes.

Q. If you can turn to page 7.

MR. SNIDOW: It looks like seven --

MS. SILVERSTEIN: Yes, the document number 7.

BY MS. SILVERSTEIN:

Q. Are you on page 7?

A. I am.

Q. And do you see where it says: Cancer?

A. I do.

Q. Would you agree that when discussing the production industry, ATSDR notes positive results for liver angiosarcoma, hepatic angiosarcoma, hepatocellular carcinoma and cholangiocellular carcinoma; is that right?

A. Yes.

Q. Pronunciation aside.

And these are all cancers of the liver or bile duct, right?

A. Correct.

Q. Any one of those listed cancers are kidney cancer, correct?

A. Correct.

(Clarification by reporter.)

BY MS. SILVERSTEIN:

Q. And as we mentioned a minute ago, we also cited the IARC 2008 monograph for vinyl chloride, right?

A. Yes.

(Freeman Deposition Exhibit 17, 2008, Lyon, France, IARC Monographs on the Evaluation of Carcinogenic Risks to Humans, Volume 97, was marked for identification.)

BY MS. SILVERSTEIN:

Q. Dr. Freeman, this is the 2008 IARC monograph on vinyl chloride that you reviewed, right?

A. Yes.

Q. Can you go ahead and turn to page 425?

A. I would love to.

I'm there.

Q. Do you see on page 425: Section 6.1, Carcinogenicity in humans?

A. I do.

Q. That section is two sentences long. It says: There is sufficient evidence in humans for the carcinogenicity of vinyl

chloride. Vinyl chloride causes angiosarcomas of the liver and hepatocellular carcinomas.

Correct?

A. Yes.

Q. If you could turn to page 31 of the document, please.

A. I'm there.

Q. Do you see: Section 6(a), Carcinogenicity in humans?

A. I do.

Q. And I want to look at: Sufficient evidence of carcinogenicity.

Do you see that?

A. Yes.

Q. The second-to-last full sentence begins with: A statement.

Do you see that?

A. Yes.

Q. It says: A statement that there is sufficient evidence is followed by a separate sentence that identifies the target organs or tissues where an increased risk of cancer was observed in humans. Identification of a specific target organ or

tissue does not preclude the possibility that the agent may cause cancer of other sites.

Do you see that?

A. I do.

Q. And you'd agree that the target organ specified in the IARC monograph didn't include kidney, correct? The kidney, right?

A. I agree.

Q. You can go ahead and set that document aside.

It's a lot of paper.

Go ahead and turn to page 54 of your report.

On page 54, in the paragraph that begins: In rats.

Do you see the sentence: Nephroblastoma, a kidney cancer also known as Wilms tumor, occurred with vinyl chloride exposures as low as 25 parts per million in a small number of animals (0.8%) but increased to effect approximately 10% of animals at higher doses.

Do you see that?

A. Yes.

Q. You'd agree that nephroblastoma

is a different type of cancer than renal cell carcinoma, right?

A. God, I have to remember the pathology of Wilms tumor. I don't know that it involves renal cells offhand.

I'd have to actually -- I'd have to actually make sure I was being correct about that. I don't know that that's necessarily correct.

Q. You'd agree that a nephroblastoma is a different type of kidney cancer than upper tract urothelial cancer, right?

A. Yes.

Q. If you'd turn to page 55 of your report?

A. I'm here.

Q. On page 55, you're discussing the application of the Bradford Hill criteria to vinyl chloride and kidney cancer, right?

A. Yes.

Q. You'd agree that consistency is not met, right?

A. Yes.

Q. You'd agree specificity is not

met, correct?
A. Yes.
Q. For strengths of association, you only discussed one study, right?
A. Yes.
Q. For biological -- well for plausibility, you discuss a study involving a nephroblastoma, right?
A. Yes.
Q. And you can't recall sitting here today whether nephroblastoma and renal cell carcinoma are the same type of cancer, right?
A. Correct. I'm not -- I'm not sure about the cell type.
Q. And for vinyl chloride, just like for TCE and PCE, if you considered a study, it would be cited in your report, correct?
A. Yes.
Q. Can you turn now to page 56 to your section on benzene?
A. I'm there.
Q. In the second paragraph you say: The evidence available on the

association between occupational exposure to benzene and cancer of the kidney was reviewed by IARC in 2012 and judged to be inadequate at that time.

Right?

A. Yes.

Q. Have you reviewed the ATSDR 2007 tox profile for benzene?

Did you want me to re-ask that? I know there was some background noise.

A. No, I heard it. I was trying to figure out what was going on out there.

I think I cite to IARC. I don't see ATSDR that is listed as one of the sources in this section.

I don't see it listed as one of the sources, so I'm not sure that it was -- whether it was a source or not for this section. But as I said, I don't see it.

Q. To the best of your recollection, have you ever reviewed the 2007 ATSDR tox profile for benzene?

A. Yes, for sure.

(Freeman Deposition Exhibit 18, August 2007 Toxicological Profile for

Benzene, was marked for identification.)

MS. SILVERSTEIN: Do you want us to send you a copy, J.J.?

MR. SNIDOW: I think I'm okay. I just looked at it and now I see why.

BY MS. SILVERSTEIN:

Q. Dr. Freeman, this is the 2007 ATSDR tox profile for benzene, right?

A. Yes.

Q. And this isn't the first time you've ever seen this document, right?

A. It is not.

Q. Can you turn to Table 6-3, which is on page 200 -- oh, geez.

A. You have me on the edge of my seat. What page am I looking for?

Q. Yeah, just a second.

MR. SNIDOW: Six point what?

MS. SILVERSTEIN: Table 6-3. Which is on page 275.

Sorry. Apologize guys. It's on page 272.

A. Okay. I'm there.

BY MS. SILVERSTEIN:

Q. This table, Table 6-3 is titled: Benzene in Food.

Correct?

A. Yes.

Q. And Table 6-3 shows that the -- in the cellular reviewing they found more than 100 parts per billion of benzene in at least one sample each of a cola, raw bananas and coleslaw, right?

A. Yes.

Q. And on page 271, if you flip back a page.

In Section 6.4.4: Other Environmental Media.

Do you see that?

A. Yes.

Q. They're discussing a study, Hattemer-Frey, et al. 1990.

And they note: Eggs had the highest concentrations (2,100 parts per billion [uncooked] and 500 to 1,900 parts per billion [hard boiled]), followed by haddock, Jamaican rum, irradiated beef, heat-treated canned beef, and butter.

Do you see that?

A. I do. I'm really disappointed to see Jamaican rum had high levels of benzene.

Q. In your opinion, should we be concerned about the level of benzene in these foods?

MR. SNIDOW: Objection to form, and beyond the scope.

A. It's not a question I examined the evidence for to be able to give you an answer.

BY MS. SILVERSTEIN:

Q. Do you have an opinion on whether we should be concerned about consuming something with 1900 parts per billion of benzene in it?

MR. SNIDOW: Same objection.

A. I have to give you the same answer. I simply haven't looked at the evidence for it to determine what a reasonable answer to your question would be.

BY MS. SILVERSTEIN:

Q. You didn't look at the evidence to determine how much benzene poses a risk of

kidney cancer?

MR. SNIDOW: Objection, misstates what he testified.

A. All of my opinions about benzene are in the section of my report on benzene.

BY MS. SILVERSTEIN:

Q. So you don't have an opinion on how much benzene someone needs to be exposed to to increase their risk of kidney cancer, is that fair?

MR. SNIDOW: Objection to form, misstates.

A. Sub thresholds don't really exist for benzene. We don't know how little it takes to cause cancer.

BY MS. SILVERSTEIN:

Q. You can go ahead and set that document aside.

A. Thank you.

MR. SNIDOW: That was 18?

MS. SILVERSTEIN: Yes.

BY MS. SILVERSTEIN:

Q. On page 59, you discuss the -- well, show the results of four epidemiologic

studies evaluating whether there's a possible dose-response relationship between benzene and colon cancer, right?

A. Yes.

Q. Only one of those four studies demonstrated a dose-dependent effect, correct?

A. Yes.

Q. And you'd agree that the Seyyedsalehi did not find a significant dose-related trend for kidney cancer, right?

A. Can you direct me to where you're looking?

Q. At the paragraph at the top of page 59, the last sentence you say: Seyyedsalehi and colleagues associated combined the findings from these studies and did not find a significant dose-related trend for kidney cancer.

Right?

A. I do see that.

Q. And you'd agree that in Table 13, you show the relative risk for Gerin 1998, right?

A. Yes, correct.

Q. And you'd agree that neither the low nor medium, high results for Gerin 1998 are statistically significant, correct?
A. I agree.
Q. Pesch -- you then have -- show the results for Pesch 2000, right?
A. Yes.
Q. And you'd agree that Pesch 2000 does not show a dose-dependent effect, correct?
A. Other than for low or no exposure to more than low or no exposure, there's not a difference between medium and high.
Q. And you don't report results for low and no exposure, right?
A. These are ratios, so they're ratios to -- they're ratios for no exposure.
Q. But you don't show any results for Pesch 2000 for low exposure; is that right?
A. That's right. I'm not sure if that's because Pesch didn't show them, or -- actually, I'm not sure why -- they might have been combined in the study.

Q. Are you aware that Pesch 2000 specifically looked at upper tract urothelial cancer?

A. I'd have to look back at Pesch to be able to answer that. I don't recall that offhand.

Q. You'd agree that Pesch 2012 does not demonstrate a dose-dependent effect, correct?

A. I do agree with that, yes.

Q. And you say in your report that Wong provided evidence showing a dose-dependent effect. Is that still your opinion?

A. Can you point me toward where you're reading --

Q. In that top paragraph on page 59 you say: Only the study by Wong and coworkers provided evidence suggesting a dose-dependent effect.

Correct?

A. Suggesting a dose-dependent effect. Yes. Yes, that is correct, that their data suggests a dose-dependent effect, but do not demonstrate it.

Q. You'd agree that the medium exposure risk ratio for Wong is 0.83, right?
A. Yes.
Q. Which does not show a positive association, correct?
A. Well, the confidence interval was too wide to draw any conclusions.
Q. Would you agree that the point estimate -- a point estimate of .83 isn't a positive correlation?
A. No, there's no correlation at all based on the width of the confidence interval, which goes down to .06.
Q. Okay.
A. And up to almost 6.
Q. For high exposure, the risk ratio is 1.54, correct?
A. Yes.
Q. The 95% confidence interval you reported there is 0.15 to 1.59, correct?
A. Yes.
Q. That's not statistically significant, right?
A. It is not.
Q. If you'd turn to page 60.

A. Yes.

Q. The last sentence in that first paragraph is: None of the studies of cancer in experimental animals reviewed in the 2018 IARC monograph on benzene describe -- described exposure associated kidney tumors. Correct?

A. Yes.

Q. And for benzene, like the other chemicals, if you considered a study when forming your conclusions, you cited it in your report, correct?

A. Yes.

Q. You can go ahead and set the kidney cancer report aside.

MS. SILVERSTEIN: And I think we've been going for over an hour, so this would be a good time for a break.

THE WITNESS: All right.

THE VIDEOGRAPHER: We are off the record at 2:50 p.m.

(Recess taken, 2:50 p.m. to 2:59 p.m. PDT)

THE VIDEOGRAPHER: We are on the record at 2:59 p.m.

BY MS. SILVERSTEIN:

Q. Dr. Freeman, during the break did you talk to anybody about the substance of your testimony?

A. I did not.

(Freeman Deposition Exhibit 19, 12-8-2024 Dr. Michael Freeman - Supplemental Materials Considered, was marked for identification.)

BY MS. SILVERSTEIN:

Q. And you are holding Exhibit 19, which is Dr. Michael Freeman's supplemental materials considered list for your kidney cancer general causation report, correct?

A. Yes.

Q. And this lists a study by Yu, correct?

A. I --

MR. SNIDOW: Y-U.

A. None of those names are mine.

MR. SNIDOW: Y-U.

BY MS. SILVERSTEIN:

Q. The author of the study, their last name is Yu, correct?

A. I could do this all day. No,

it ---

Yes, it is Yu, spelled Y-U.

Q. Okay.

A. Sorry.

Q. And aside from this study here, by authors, Yu, Y-U, and the citations in your kidney cancer report, there are no other studies, articles, materials that you reviewed for your kidney cancer report, correct?

A. Not that I'm aware of or can think of, yes.

Q. You can go ahead and set that to the side.

A. Sorry for the schtick.

MR. SNIDOW: Yeah. It's getting late here.

BY MS. SILVERSTEIN:

Q. Could you go ahead and pull out your Parkinson's Disease report? Which is, I believe, Exhibit 3.

A. Yes. Yes, it is.

Q. And, Dr. Freeman, you're not offering any opinion about whether or not DCE causes Parkinson's Disease, correct?

A. Correct. I'm only addressing the four chemicals that we talked about previously.

Q. Could you go ahead and turn to page 37?

A. I'm there.

Q. In your opinion, there is below equipoise evidence of a causal relationship between vinyl chlorides and the Camp Lejeune water and Parkinson's Disease, correct?

A. Yes.

Q. And that's because there's not sufficient epidemiologic and mechanistic studies, right?

A. I agree.

Q. And it's your opinion that there's below equipoise evidence for a causal relationship between benzene and Parkinson's Disease, correct?

A. I agree.

Q. Because, again, there's not sufficient epidemiologic and mechanistic studies, right?

A. Yes.

Q. And you'd agree that

Parkinson's Disease is not a cancer, right?
A. I do agree with that.
Q. Great.
It's a neurological condition, right?
A. Yes, a neurodegenerative condition.
Q. So a chemical's -- a potential carcinogenicity doesn't tell us whether or not the chemical can cause a neurodegenerative disease, right?
A. Agreed.
Q. Can you turn to page 31?
And do you see, actually beginning with the bold there, the: Median cumulative exposure was 4,970 micrograms per liter per month, more than 50 times the permissible level?
Do you see that?
A. Yes.
Q. How did you determine the permissible level?
A. Give me a minute.
[Document review.]
A. It was from the ATSDR report, I

believe.
BY MS. SILVERSTEIN:
Q. What measure in the ATSDR report?
A. The one that said it was more than 50 times the permissible level.
Q. Do you know what the permissible level is?
A. I do not specify that here in my report, from what ATSDR says.
Q. Would you agree that MCLs represent the highest level of a contaminant that's allowed in drinking water?
A. It sets a standard for that, yes.
Q. And would you agree that drinking water contamination is governed by the Safe Drinking Water Act?
A. I think the regulation of drinking water is somewhat beyond me.
Q. Okay.
A. It would make sense that it would be governed by the Safe Water Act; however, I don't know what else, local regulations, state wide, county wide, might

also govern drinking water safety.
Q. Are MCLs something you are familiar with?
A. Yes.
Q. And you'd agree that MCLs are based on health conservative assumptions incorporated in decision-making processes, right?
MR. SNIDOW: Objection to form, and beyond the scope.
A. Yes, I do agree with that.
BY MS. SILVERSTEIN:
Q. Can you turn to page 37?
And it's your opinion that there is sufficient evidence for a causal relationship between TCE and Parkinson's Disease, right?
A. Yes, and specifically at Camp Lejeune.
Q. And you'd also agree that there haven't been any TCE specific meta-analyses for Parkinson's, correct?
A. Yes, I agree.
Q. And that the epidemiologic evidence on TCE and Parkinson's Disease is

limited?

A. It is.

Q. In your opinion, there is equipoise and above evidence for a causal relationship between PCE and Parkinson's Disease, right?

A. Yes.

Q. You'd agree that epidemiologic evidence is roughly equivalent for PCE and Parkinson's Disease as to TCE and Parkinson's Disease?

A. Yes.

Well, it's a bit more sparse. It's not exactly equivalent. There's a reason why I characterized it as being equipoise and above rather than being sufficient.

Q. And would you agree that equipoise and above means that there's less evidence for PCE than for TCE?

A. Yes.

Q. And you agree that the mechanistic evidence for Parkinson's Disease is lacking for PCE, right?

A. Yes.

Q. I want to talk about the Goldman studies that you referenced.

You'd agree that the studies by Bove that we discussed earlier and by Goldman are the main epidemiology studies for PCE or TCE in Parkinson's Disease, right?

A. And Camp Lejeune exposure, yes.

Q. Okay. I'm handing you another document.

(Freeman Deposition Exhibit 20, Solvent Exposures and Parkinson Disease Risk in Twins, was marked for identification.)

BY MS. SILVERSTEIN:

Q. Dr. Freeman, you were just handed Exhibit 20, which is titled: Solvent Exposures and Parkinson Disease Risk in Twins.

Correct?

A. Yes.

Q. And this is Goldman 2012, right?

A. Yes.

MR. SNIDOW: I think not.

MS. PLATT: Sorry, I handed you

the wrong one.

BY MS. SILVERSTEIN:

Q. This is Goldman 2012, right?

A. Yes.

Q. And this is one of the studies that you reviewed to draw your conclusion on TCE or PCE and Parkinson's Disease, right?

A. Yes.

Q. If you turn to page 777.

A. Okay.

Q. Under "Results," you'd agree that this is a study analyzing 99 twin pairs, correct?

A. Yes.

Q. And the study relied on self-reporting, right?

A. Yes.

Q. Where informants weren't available, it relied on proxy reporting, right?

A. Yes.

I've got 99 twins. It would approximate one.

MR. SNIDOW: Didn't see that reference coming up in this particular

deposition.

BY MS. SILVERSTEIN:

Q. The study inferred solvent exposure was based on occupational and hobby history, correct?

A. Yes.

Q. And it didn't have specific exposure data for the study population, right?

A. Yes.

Q. And inferring exposure based on job and hobby history creates the potential for exposure misclassification, right?

A. Potentially.

Q. Would you agree that twins don't have identical exposures, particularly in adulthood?

A. Yes.

Q. Where they live could lead to different environmental exposures, right?

A. Potentially, yes.

Q. Where they work could lead to different environmental exposures, right?

A. Potentially, yes.

Q. And Goldman 2012 didn't have

access to other exposure information, right?
A. Other than what they took out of the interviews of the individuals or the proxies, I agree.
Q. And they didn't have access to the residential history of the participants, right?
A. That I can't tell you off the top of my head.
Q. Go ahead and turn to page 780.
Would you agree that TCE, PCE, and CC14 have been used extensively worldwide for decades?
MR. SNIDOW: CCL4.
MS. SILVERSTEIN: Oh, thank you.
MR. SNIDOW: Yep.
BY MS. SILVERSTEIN:
Q. Would you agree that TCE, PCE, and CCL4 have been used extensively worldwide for decades?
A. I would agree it says that here, yes.
Q. Can you go to Table 3?
A. Okay.

Q. You'd agree that the odds ratio for TCE in Table 3 is 6.1, right?
A. I do.
Q. And the confidence interval is 1.2 to 33, right?
A. Yes.
Q. Do you agree that 1.2 to 33 is a wide confidence interval?
A. I do.
Q. And you'd agree that Goldman found the relative risk ratio for -- the odds ratio, excuse me, for PCE to be 10.5, right?
A. Yes.
Q. On the confidence interval for PCE is 0.97 to 113?
A. Yes.
Q. That's a wide confidence interval, right?
A. Very.
Q. And it's not statistically significant, right?
A. It's pretty darn close.
Q. You'd agree that the lower 95 -- the low end of the 95% confidence interval is below 1?

A. Barely, but not to the point where you'd reject the finding and say, I don't believe it. It's just outside of the arbitrary cut off of .05.

Q. Okay. You'd agree that the .97 is below 1 as well, right?

A. I agree that .97 is below 1, yes.

Q. And you'd agree that Goldman 2012 only considered nine test individuals exposed to TCE, right?

A. Hold on a second here.

MR. SNIDOW: Do you want to say the question again, Kailey?

BY MS. SILVERSTEIN:

Q. Sure. Would you agree that Goldman 2012 only considered nine test individuals as exposed to TCE?

MR. SNIDOW: Objection to form. Misstates testimony.

[Document review.]

A. So the number of controls that have a history of exposure is your question. What's the number of -- or the number of cases that have a history of exposure. Which

one were you asking me about?
BY MS. SILVERSTEIN:
Q. Do you see the second column it says: Case Positive, Control Negative?
A. Yes.
Q. And the number of individuals for TCE considered there is 9, right?
A. That have a history of TCE exposure, yes.
Q. In that same column for PCE, the number of individuals considered is 5, correct?
A. Yes.
Q. Turning --
A. Not considered, but who had a positive history.
Q. Can you turn to page 781, please.
A. I am there.
Q. The very last paragraph that begins on page 781. It says: The major limitations of the study are its small sample size, which yielded imprecise risk estimates, and exposure inferences based on retrospective recall -- a virtually

unavoidable limitation of a disease such as PD, in which relevant exposures may occur decades before clinical disease is apparent.

Right?

A. It does say that, yes.

Q. And then, on page 782, at the bottom of that paragraph that began on the prior page.

Two sentences from the bottom of that paragraph. It says: Another limitation is the difficulty isolating specific effects of single agents, because many work settings involve exposure to multiple agents.

Right?

A. Yes.

Q. You can go ahead and set Goldman 2012 aside.

A. All right.

(Freeman Deposition Exhibit 21, Risk of Parkinson Disease Among Service Members at Marine Corps Base Camp Lejeune, was marked for identification.)

BY MS. SILVERSTEIN:

Q. You were just handed Exhibit 21, which is titled: Risk of Parkinson Disease Among Service Members at Marine Corps Base Camp Lejeune.

Right?

A. Yes.

Q. And that's the 2023 publication by Goldman?

A. Yes.

Q. And you relied on Goldman 2023 in forming your conclusions about Parkinson's Disease and PCE and TCE, correct?

A. Exposure at Camp Lejeune, yes, correct.

Q. You'd agree that the sample population for Goldman 2023 was the same population as in Bove 2014, right?

A. I think so.

Q. Turn to page 674.

A. I'm there.

Q. And do you see where it says: Cohort Assembly?

A. Yes.

Q. The bold heading?

A. Yes.

Ahh, "as reported by Bove." There it is.

Q. Right. It says the: Study cohorts were previously assembled by the US Agency For Toxic Substances and Disease Registry (ATSDR) as reported by Bove et al.

Correct?

A. Yes.

Q. And is the same population in Goldman 2023 the same as in the Bove 2024 study, correct?

A. Yes.

Q. And Goldman 2023 -- Goldman 2023's cohort included only individuals who used veterans health administration or Medicaid health services, right?

If you look at the sentence before: Parkinson Disease ascertainment?

A. I see that. Yeah, I was trying to determine if I can fully agree with you, only because they started out with the total cohort, and then they did narrow it down to the group that had VA, or Medicare healthcare services.

Q. Right. They say: The cohort included 1,000 -- or 172,128 individuals who served at Camp Lejeune and 168,361 who served at Camp Pendleton. Within these, we identified an analytic cohort that included all individuals who ever used Veterans Health Administration (VHA) or Medicare healthcare services.

Correct?

A. Yes.

Q. So individuals who never received VHA or Medicare services were not included in the Goldman 2023 analytical cohort, right?

A. Yes.

Q. And that could limit a study population, right?

MR. SNIDOW: Objection to form.

A. It depends on your study population. I mean, it -- if your study population is all older people, which is what you would expect for generally veterans, and certainly -- but also Medicare recipients and for people with a diagnosis of Parkinson's, then there might be some limitation, but it

would not necessarily be a drastic reduction.
BY MS. SILVERSTEIN:
Q. You didn't analyze how much the cohorts from Bove were reduced to meet the analytical cohort requirement of individuals who used VHA or Medicare services, did you?
A. I did not describe it in my report that I can recall, so no.
Q. And sitting here today, it's not something that you are aware of?
A. Well, it's in Table 1, so -- I mean, I can look at Table 1 and tell you.
Q. It's not something that you described in your report, right?
A. I don't believe so, no.
Q. You'd agree that Goldman 2023 did not have data on direct exposure, right?
MR. SNIDOW: Object to form, vague.
A. Quantitative exposure? I think? Is that -- am I interpreting that question correctly?
BY MS. SILVERSTEIN:
Q. You'd agree that Goldman 2023

did not have data on the exposure levels for the study participants, correct?

A. Not quantifying the individual chemicals they were exposed to, yes.

Q. Turn to page 279.

A. Did you -- you said 679, right? Or did you --

Q. I didn't, but that's what I meant.

A. You meant to say 679? All right.

Q. Yeah.

In the right-hand column, the first full paragraph. Do you see that?

A. Highly plausible?

Q. Yes.

The second sentence in that paragraph acknowledges that the authors: Cannot be certain that everyone who resided at Camp Lejeune between 1975 and 1985 was in fact exposed to biologically meaningful levels of contaminants.

Right?

A. Yes.

Q. And they didn't account for

other environmental exposures that individuals may have sustained before, during, or after military service, right?

A. That's true.

Q. Goldman 2023 had the conclusion on the association between Parkinson's and TCE, right?

A. Yes.

Q. They don't have -- they did not suggest an association between PCE and Parkinson's, right?

MR. SNIDOW: Objection to form.

A. Only that they could have contributed, not that they did.

BY MS. SILVERSTEIN:

Q. Turn to Table 3.

A. Okay. I'm there.

Q. Now I just have to get there.

Table 3 is the: Risk of Parkinson Disease in Residents of Camp Lejeune vs Camp Pendleton.

Right?

A. Yes.

Q. And for possible or probable PD, they note an odds ratio of 1.7, right?

A. Yes.
Q. When they -- for PD ascertained before January 13, 2017, the odds ratio is only 1.28, correct?
A. Yes.
Q. And the confidence interval for Parkinson's ascertained before January 13, 2017, the confidence interval includes 1, right?
A. It does.
Q. Are you aware that January 13th, 2017, is when the VA designated Parkinson's as a presumptive service connected condition for veterans at Camp Lejeune?
A. If I noted that in my report I would have been aware of it, but I don't recall specifically whether that's noted or not.
Q. If you turn to page 674.
A. Okay.
Q. And on the left-hand side, the second paragraph, at the bottom it says: Despite relatively limited human epidemiology, in light of this contamination,

on January 13, 2017, the U.S. Congress and Veterans Administration (VA) designated PD a presumptive service-connected condition for veterans who served at Camp Lejeune between August 1st, 1953, and December 31st, 1987, making them eligible for benefits.

Correct?

A. That it says that? Yes.

Q. Would you agree that information collected after January 13, 2017, could have a reporting bias?

MR. SNIDOW: Object to form.

A. I do agree with that.

BY MS. SILVERSTEIN:

Q. And a reporting bias could be a limitation of the study, right?

A. Potentially.

Q. You can go ahead and set that document aside.

(Freeman Deposition Exhibit 22, Parkinson's Disease Progression and Exposure to Contaminated Water at Camp Lejeune, was marked for identification.)

BY MS. SILVERSTEIN:

Q. You were just handed Exhibit 22, which is titled: Parkinson's Disease Progression and Exposure to Contaminated Water at Camp Lejeune.

Right?

A. Yes.

Q. This is by Goldman, right?

A. Yes.

Q. Who is the same author of the 2012 and 2023 studies that we discussed, right?

A. Yes.

Q. And this is his 2024 study?

A. Yes.

Q. And this is a study that you analyzed and considered in forming your conclusions about Parkinson's Disease, right?

A. Yes.

Q. This is the same population that was analyzed in Bove 2024, right?

A. Yes.

Q. And this study is again limited to only those individuals that received healthcare through the veterans health

administration or Medicare, right?
A. Yes.
Q. And Goldman -- the authors, didn't have data on other lifetime exposures for the participants, right?
A. Correct.
Q. Would you agree that Goldman did not observe an earlier age of Parkinson's diagnosis in exposed individuals?
If you want to turn to page 1737.
Are you on page 1737?
A. I'm there, yes.
Q. In the right-hand column, that paragraph that starts on -- in the other column, the authors wrote: We did not observe an earlier age at PD diagnosis in exposed individuals as has been reported for hydrocarbon-exposed workers.
Right?
A. Yes.
Q. You'd agree that Goldman 2012, Goldman 2023, and Goldman 2024, all have the same primary author, right?
A. Yes.

Q. You can go ahead and set that aside.

If you'd turn to page 32 of your report.

A. I'm there.

Q. On page 32, you discuss Pezzoli and Cereda's 2013 meta-analysis, right?

A. Yes.

Q. And are you aware that Pezzoli and Cereda did not specifically evaluate TCE?

A. I am.

Q. Dr. Freeman, you'd agree that PCE and TCE are different chemicals, right?

A. I do.

Q. Do you agree that there are no mechanistic studies on PCE and Parkinson's Disease?

A. I do.

Q. And there are no epi studies showing a statistically significant association between PCE and Parkinson's Disease, right?

A. I agree.

Q. It's your opinion that there's equipoise and above evidence for a causal

association between PCE and Parkinson's Disease, right?

A. Yes.

Q. Which I think we discussed earlier, that's a lower level of evidence than your opinion on TCE and Parkinson's Disease, right?

A. I agree.

Q. The reason for the lower level of evidence for PCE is that there's only indirect mechanistic evidence for PCE in Parkinson's, right?

A. Yes.

Q. If you look at page 37 of your report.

And on page 37 to your opinion for PCE. You say: However, since PCE can be metabolized to TCE by microbes in groundwater, and since TCE and PCE share some common metabolites there is indirect mechanistic evidence for PCE and PD.

Right?

A. Yes.

Q. You didn't provide any citations for this statement, right?

A. That's discussed earlier in the report.

Q. When you're discussing it in your conclusions, you didn't provide any citations, right?

A. No, because it was, again, earlier in the report.

Q. Where earlier in the report is this?

[Document review.]

A. Page 15.

BY MS. SILVERSTEIN:

Q. Did you say 15?

A. Page 15, yes.

Q. This is about the degradation of chemical contaminants of the Camp Lejeune water, right?

A. Yes.

Q. And here you say: Notably, PCE breaks down to TCE by the removal of one chlorine (dechlorination) anaerobically and that vinyl chloride is a breakdown product of both PCE and TCE after additional dechlorination.

Right?

A. Yes.
Q. So in this section, it looks like you have three citations, one to Valdiviezo, from 2022, right?
A. V-A-L-D-I-V-I-E-Z-O.
Q. And then, the others -- one of the other citations is the IARC working group on evaluation of carcinogenic risks to humans, right?
A. Yes.
Q. And you'd agree that Parkinson's Disease is not a cancer, right?
A. Yes. This is only support for the degradation of the Camp Lejeune water in the environment -- or the -- sorry, the contaminants of the Camp Lejeune water in the environment. It does not reference diseases associated with it.
Q. But you still agree that Parkinson's is not a cancer, right?
A. Yes, that hasn't changed since we started talking.
Q. And the third document that you cite is Dolinova, et al., from 2017, correct?
A. Yes.

Q. And then you cite Emsbo-Mattingly 2022, right?

A. Yes. Dolinova is D-O-L-I-N-O-V-A.

Emsbo-Mattingly is E-M-S-B-O hyphen M-A-T-T-I-N-G-L-Y.

Q. Dr. Freeman, do you consider yourself an expert in pharmacokinetics?

A. No. I have a -- I have a -- what I would say is a relatively minimal background in it compared to people who are experts in it.

Q. Okay. And are you an expert in physiologically-based pharmacokinetic modeling?

A. Even less so.

Q. What studies are you relying on to show that TCE and PCE are sufficiently analogous for studies related to TCE to be extrapolated to PCE?

A. I didn't make that statement in my report.

Q. In your opinion, can -- in your opinion, are TCE and PCE sufficiently analogous to allow studies related to TCE

specifically to be extrapolated to PCE?
A. No. Only that TCE -- or PCE is converted in the environment to TCE. And that TCE as a demonstrable relationship to a Parkinson's Disease risk in the Camp Lejeune cohort.
Q. Have you reviewed an article Trichlorethylene, a ubiquitous environmental contaminant in the risk for Parkinson's Disease by Dameranda?
A. Is it cited in my report?
Q. Have you ever reviewed -- or do you recall ever reviewing this article by Dameranda?
A. I couldn't tell you off the top of my head.
Q. I'll represent that it's not cited in your report.
A. Okay.
Q. And are you -- do you recall reviewing this article in any other context?
A. Not offhand, no.
Q. Would you agree that closely related chemical structures doesn't necessarily mean that two chemicals have the

same biological effect?
A. I do agree with that.
Q. Would you agree that PCE is more dense than TCE?
A. PCE is more dense. Do you mean chemically, because it's got extra chlorine?
Q. Yes.
A. I guess you would call this dense.
Q. Would you agree that PCE is less soluble than TCE?
MR. SNIDOW: Let me interpose a form and scope objection.
A. By the nature of its chemical composition, I would agree.
BY MS. SILVERSTEIN:
Q. Would you agree that PCE is less volatile than TCE?
A. I would say based on the same principle, yes.
Q. Okay. You can go ahead and set aside your Parkinson's Disease report for now.
In your opinion, the levels of chemicals in the Camp Lejeune water were

hazardous to human beings. Is that fair?
A. Yes.
Q. Can you turn to page 66 of your kidney cancer report? Which is Exhibit 2.
A. I'm on page 66.
Q. On page 66, I'm looking under the heading --
A. Did you say 56 or 66?
Q. 66.
A. Okay.
Q. I'm looking under the heading: Levels of contaminants that have been associated with hazards to humans and causal relationship to kidney cancer.
Do you see that?
A. I do.
Q. You say: Moore and co-workers showed that average exposures to TCE at levels at or exceeding 76 parts per billion were associated with a significantly increased risk of renal cancer (odds ratio, 2.41; 95% confidence interval 1.05, 5.56). The risk associated with TCE exposures less than 76 parts per billion was also elevated (odds ratio 1.73) but the difference was not

statistically significant. The mean TCE concentration in the Hadnot Point system was 358.7 parts per billion between 1975 and 1985.

Right?

A. Yes.

Q. Does your opinion that the Camp Lejeune water is hazardous to human health, and has a causal relationship to kidney cancer and Parkinson's Disease, does that only apply to the time period 1975 to 1985?

MR. SNIDOW: Objection to form.

A. No.

BY MS. SILVERSTEIN:

Q. What time frame does that apply to?

MR. SNIDOW: Objection to form.

A. I have not restricted it to any particular time frame during which there's been identified a hazard in the water.

I understand the 75 to 85 as the period in which it's thought that the concentrations were at their highest level, but I don't have any evidence that allows me to discriminate between those times.

BY MS. SILVERSTEIN:

Q. And you'd agree that the Bove studies and the Goldman studies were both -- were all restricted to 1975 to 1985, right?

A. Right. Because of the greater availability of information on where people were stationed.

Q. So you haven't --

A. To my understanding.

Q. Apologies. I didn't mean to cut you off there.

Did you finish your answer?

A. I believe so.

Q. Okay. I apologize.

You didn't review any studies about the Camp Lejeune water prior to 1975, right?

A. That's correct, yes.

Q. You haven't then analyzed whether there is a positive association between the Camp Lejeune water prior to 1975 and kidney cancer with Parkinson's Disease. Is that fair?

A. Correct. I'd have to go back to the statement that I don't have enough

evidence to discriminate between those times.
Q. Sure. Would it be fair to say you also don't have enough evidence to conclude that before 1975 there's evidence of a causal relationship?
A. If I was asked if it's a reasonable inference based on what we know about '75 to '85, I would say yes, but I don't know the magnitude of the relationship.
Q. Is your opinion limited to exposure from the Hadnot Point water system?
A. I believe that that's not the case. I think I state in the report that it's not just Hadnot.
Q. Hadnot Point?
A. It's not just Hadnot Point. That it's also the Tarawa system.
Q. So is your opinion, then, limited to Hadnot Point and Tarawa Terrace?
A. It would be what is specified in my report. But those are the two main contamination areas that are described.
Q. Do you have an opinion on whether any water system other than the Hadnot Point and Tarawa Terrace water systems

had enough of any contaminant to cause either kidney cancer or Parkinson's Disease?

A. I don't have evidence that they didn't, I think is the best way to approach it.

I mean, there's evidence that people who were in the area and were exposed to the water had increased risks of certain diseases, exactly where that water came from, is something that is difficult to determine. I haven't delved into that opinion in any detail outside of what's in my report.

Q. Since you are -- looked at the ATSDR water modeling, you are aware that they modeled contamination for Hadnot Point and Tarawa Terrace, right?

MR. SNIDOW: Objection to form, scope.

A. I believe that is correct, actually.

I didn't mean to make that sound like you actually said something correct. I mean, I think I agree off my memory that that was the two areas that were --

Q. Are you aware there are six other water systems that ATSDR did not model any contamination at?

A. I couldn't tell you the total number of water systems, but I know they focused on those two. So to the extent that there were other water systems, that makes sense.

Q. Since you reviewed the ATSDR water modeling, are you aware that there were some months where ATSDR modeled mean monthly concentrations of one or more chemicals was 0 micrograms per liter?

A. Yes, I described that in my report.

Q. And is it your opinion that even in those months where ATSDR modeled one or more chemicals at 0 micrograms per liter, the Camp Lejeune water was hazardous to humans and could cause kidney cancer or Parkinson's disease?

A. I believe the question is if there were times where there was very -- if I understand it correctly, there were times when there was no chemicals in the water? If

that was actually true, would that have the same risks as the other months when there were chemicals modeled in the water, the answer is presumably not.

Q. Were you aware that ATSDR has said that their water modeling represented a conservative estimate of the amount of contaminants in the water?

MR. SNIDOW: Object to form.

A. Yes.

BY MS. SILVERSTEIN:

Q. And you're aware that Dr. Bove's ATSDR studies didn't evaluate how much of any chemical a participant -- that the participants in the study were actually exposed to, right?

A. Yes.

Q. And it didn't analyze what the participant's dose of any chemical was, right?

A. Yes. I think we've already talked about that.

Q. Did you consider possible dose in your analysis?

MR. SNIDOW: Objection to form,

vague.

A. The exposures that I talked about had to do mostly with time. But I did talk about dose to some degree.

To the extent it's in my report, yes, but I didn't attempt to do any kind of specific quantification outside of what was related in the materials I reviewed.

Q. Do you have an opinion on what average daily dose a person needs to be exposed to to increase their risk of kidney cancer or Parkinson's Disease?

MR. SNIDOW: Objection to form.

A. My opinion is that that's not been established. There is no threshold dose.

BY MS. SILVERSTEIN:

Q. And when you say there is no threshold dose, do you mean that it's your opinion that it can be caused at any level of exposure? Or just that we don't know what the minimum required exposure is?

A. The latter. Because it's a multifactorial illness. Both PD and kidney cancer are multifactorial illnesses. It's

reasonable to assume that different levels of exposure are required for different individuals to trigger the disease.

Q. Would you agree that they have some threshold amount being required for an individual to acquire a specific disease is a widely accepted scientific principle?

MR. SNIDOW: Objection to form.

A. Depends on what you're studying.

BY MS. SILVERSTEIN:

Q. So, for TCE, would you agree that there's some threshold dose by which before that individuals can be exposed to the contaminant and not increase their risk of kidney cancer or Parkinson's Disease, and after that amount, it could increase their risk?

MR. SNIDOW: Objection to form.

A. There's a vague gray area type of a threshold, I think that's not unreasonable for the individual chemicals. How the chemicals work together as an additive or possibly synergistic effect, though, is completely unknown.

MS. SILVERSTEIN: I think we've been going for almost an hour. Just under an hour, so this is a good spot to take a break.

THE VIDEOGRAPHER: All right. We are off the record at 3:50 p.m.

(Recess taken, 3:50 p.m. to 3:58 p.m. PDT)

THE VIDEOGRAPHER: We are on the record at 3:58 p.m.

BY MS. SILVERSTEIN:

Q. Dr. Freeman, did you talk to anybody about the substance of your testimony during the break?

A. I did not.

Q. Could you turn to your kidney cancer report, Exhibit 2?

A. I'm looking at it.

Q. Can you go to page 23, please?

A. Yes.

Q. Under the heading: Evidence against a causal relationship.

Well, I guess not really under that heading, but after that heading you have a paragraph that starts: As described above.

Do you see that?

A. Yes.

Q. And it says: As described above, the Camp Lejeune Justice Act of 2021 specified that claimants who file in court are entitled to a standard of proof lower than the preponderance-of-the-evidence standard typically used in tort cases and that they need only show that "a causal relationship is at least as likely as not" corresponding to the ATSDR classification "equipoise and above."

Did I read that correctly?

A. You did.

Q. Where did you get the "at least as likely as not" language from?

A. From the Camp Lejeune Justice Act of 2021.

Q. Dr. Freeman, you'd agree you're not an expert in legal analysis, right?

A. I'm an expert in medical/legal analysis, which has an element of legal analysis to it, but not in just legal analysis, per se.

Q. Are you an expert in statutory

interpretation?

A. No, definitely not.

Q. And you don't have a law degree, right?

A. No. My wife has promised she'd divorce me if I got one.

Q. No more degrees for you.

And so my understanding, then, is you used the "at least as likely as not" language because it's in the Camp Lejeune Justice Act; is that right?

A. Yes.

Q. Did you review the entire statute?

A. Yes. Somewhere along the line, yes. Along the way.

Q. Were you asked or instructed by anybody to include the "at least as likely as not" language?

MR. SNIDOW: Ob --

A. No.

Sorry.

MR. SNIDOW: It sounds like we're fine, but just instruct you to preserve privilege.

A. No. But that would be critical for my analysis to understand what legal standard is being applied for the interpretation of the causal evidence.

BY MS. SILVERSTEIN:

Q. Have you used "at least as likely as not" in any scientific publications that you've authored?

A. No, I have not. I have used only substantial factor.

Q. Have you seen the language "at least as likely as not" in peer-reviewed literature that you've reviewed?

A. I can't tell you that I have any specific recollection that I have or haven't.

Q. And you state here that the "at least as likely as not" standard corresponds to the ATSDR classification of equipoise and above, right?

A. Yes.

Q. And is your understanding that this is from the ATSDR 2017 Public Health Assessment?

A. Yes.

Q. Are you aware that the 2017 Public Health Assessment is a regulatory document?

A. That's my understanding, yes.

Q. And you'd agree that regulatory work and litigation are different, right?

A. Yes.

Q. Have you used the phrase "equipoise and above" in any scientific publications that you've authored?

A. No. That's -- I think you already asked me that. Did you not?

Q. I asked you earlier about whether you used the language "at least as likely as not" in any scientific articles that you've authored.

A. Right. Which I interpret as equipoise.

Q. But you haven't used the language "at least as likely or not" or "equipoise and above" in any of your scientific publications, right?

A. No, I'm quite sure I have not.

Q. Would you agree that agency -- your regulatory work is different than

scientific research?

A. I think they're Venn diagrams with lots of overlap, including overlap with legal and statutory requirements.

They all have to overlap, they all have to intersect if courts are going to consider scientific evidence.

Q. Would you agree that a regulatory health agency, for example, could make decisions at a lower standard of evidence to protect the public health?

A. Yes.

Q. And that could include sometimes making decisions where there's not a lot of evidence of causation, right?

MR. SNIDOW: Objection to form.

A. Well, there has to meet some sort of -- some sort of a threshold has to be met to determine that there's a hazard and that hazard is likely to be nontrivial. But at that point in time, the -- because evidence increases over time, making an advanced regulatory decision, that is intended to favor a protection of public health, is what public health agencies are

mandated to do.

So, yes, I agree with, I think, everything that you just said.

BY MS. SILVERSTEIN:

Q. Would you agree that equipoise denotes a lack of consensus across the medical community?

MR. SNIDOW: Objection to form.

A. No.

BY MS. SILVERSTEIN:

Q. In your opinion, does equipoise mean that the scientific community has consensus that the evidence for that exists?

MR. SNIDOW: Object to the form.

A. I think it's more complicated than that when you're talking about a contaminated site where there has been evidence that there is disease manifestation associated with the site, so that, for other diseases where there might be -- it's not found to be less than equipoise, at equipoise, I think that the intent then is to satisfy that requirement that you're talking about, which is, we know this place is

dangerous, we have evidence which is somewhat equivocal, but we're going to include that as a means of protecting the public. That's not a scientific consensus or community consensus issue.

BY MS. SILVERSTEIN:

Q. So just to make sure I understood what you said correctly, would it be fair to say that when a public health agency makes a determination that evidence is equipoise or higher, that doesn't mean that the scientific community is weighing in and agrees that there is sufficient evidence of -- or equipoise evidence of causation?

MR. SNIDOW: Object to form, scope.

A. Well, I think equipoise evidence is something that is scientifically determined. So I don't think that that's really an issue.

I think it goes back to the explanation I gave you before. If we're talking about a place that's known to be dangerous and we have another illness that we're -- that we're examining it and the

evidence is equivocal, that action can be taken based on that evidence. That concept is trans -- apparently has translated into the statutory language. That's not a scientific community issue. Again, it is how we protect the community.

So that's -- I see this as being a rather unique situation, in which the -- a different standard or a lower standard has made its way into, okay, how are we going to evaluate the scientific evidence? Not the way we normally would if we're putting into the peer-reviewed literature, but we're doing it in a way that we're going to satisfy statutory language.

And then, of course, we also can include a higher level of risk, however, including that lower level, where it's equivocal, is based on -- I think, again, going back to that term, that web of evidence, or -- that's used to build a causal -- a causal judgment.

BY MS. SILVERSTEIN:

Q. How do you determine what standard of review you use in an expert

report?

A. What do you mean by "review"?

Q. How do you determine whether you use a standard "at least as likely as not" versus preponderance of the evidence, versus sufficient factor, or something else in your scientific review?

A. It's typically statutory language for whether we're dealing with a preponderance of evidence issue or a substantial causation issue. Those are the two major areas in which there will be a difference of magnitude of strength of association in the cases that I'm involved with. This is the first instance in which I've dealt with equipoise or better.

Q. So then would it be fair to say that when you say in your expert reports that you're holding your opinion to a reasonable degree of medical or scientific certainty, what reasonable degree of medical or scientific certainty means can change in each of your reports?

A. No. That's not true. It is -- the reasonable degree of medical or

scientific certainty or probability refers to my confidence in the opinions I've given. It doesn't refer to the strength of evidence.

Q. Okay.

So, then, the strength of evidence, for example, if you were reviewing the relationship between PCE and Parkinson's Disease in a case where the standard of review was more likely than not, or say preponderance of the evidence, you might have a different conclusion than you did in your report for Camp Lejeune. Is that fair?

MR. SNIDOW: Object to form, incomplete hypothetical.

A. If the standard is more likely than not, then that's a threshold. That's the 2.0 threshold.

So a study either meets it -- or findings either meet it or they don't meet it. If we're talking about substantial factor, then that's above equipoise, but it could be below 2.0.

So the study either meets that or it doesn't. That's -- but there's still a yardstick to judge by in that case, as there

is with equipoise or better.
BY MS. SILVERSTEIN:
Q. What's the yardstick that you're judging by for equipoise?
A. It's the language that's in my report, which is it's -- it's 1.0 or better, it's equipoise or better. And the -- that is a -- that is a standard that is described in the statutory language. Or the ATSDR language, rather.
So I'm using that language to describe it. It's not a standard that I manufactured, it's a standard that I'm just representing what I've read.
Q. And to the best of your recollection, did the Camp Lejeune Justice Act specify that the standard from ATSDR 2017's Public Health Assessment should be used to evaluate the scientific evidence?
MR. SNIDOW: Object to form.
A. I don't think I specified that in my report, so I can't tell you what the answer is off the top of my head.
BY MS. SILVERSTEIN:
Q. And you don't recall from

reviewing the Camp Lejeune Justice Act?

A. I didn't memorize it, so no.

Q. Dr. Freeman, would you agree that the -- that you believe the appropriate standard for a scientific conclusion in the field of forensic epidemiology depends on the jurisdiction?

MR. SNIDOW: Objection to form.

A. It depends on what the statutory language is for that particular jurisdiction.

BY MS. SILVERSTEIN:

Q. So it could differ between two cases you're an expert witness on, is that fair?

A. Certainly. If you're talking about, for example, California law. Substantial factor causation is quite a bit different, the preponderance of evidence, but it is defined statutorily.

Q. Have you ever applied the "at least as likely as not" standard in your expert work for criminal cases?

A. No. That wouldn't be appropriate.

Q. And I apologize if I already asked and answered you this, but have you applied the "at least as likely as not" standard in other cases that you've been an expert for?

A. I have not.

You did ask me before.

MR. SNIDOW: Asked and answered.

MS. SILVERSTEIN: I appreciate you providing me the answer a second time.

BY MS. SILVERSTEIN:

Q. Earlier you talked about someone that you worked with, Dr. Teeter; is that right?

A. Yes.

Q. How did you and Dr. Teeter determine which parts of the report he would work on versus you?

MR. SNIDOW: Objection, asked and answered.

A. Largely through discussion of what do you want to take on, what can you take on, what are you most comfortable with,

versus what I could take on. It had to do with timing, for me, and his interest in particular topics that he was chasing down.

BY MS. SILVERSTEIN:

Q. For your kidney cancer report, are there any sections that you did the research and the first draft of?

A. Yeah, there's a bunch of sections that I did the research for drafting it.

Q. And for your kidney cancer report, are there sections that Dr. Teeter did the research and first draft of?

A. First draft of the report was all my editing. So I took his information as basically the information I incorporated into the report, but everything was edited by me. So all those words are -- virtually all of those words are words that I have written, but some of it -- some of the information is based on information I got through Dr. Teeter.

Q. When you say "words that you edited," do you mean that you took his research and then drafted a paragraph for the

first time? Or do you mean you took a paragraph and modified the paragraph to language you were more comfortable with?

A. Depends. Usually the latter, but sometimes the former.

Q. Do you recall which sections it was the latter for?

A. No.

Q. Were there any chemical-disease pairings that Dr. Teeter did the primary work and you came in and edited paragraphs that he had initially drafted?

A. Well, like I said, anything he sent to me was edited and turned into my own words. Not to say that he's not an excellent writer, but I have my own particular style.

Q. Okay. Did you read every study that you cited in your report?

A. If I cited it, I read it.

Q. So all of the studies cited in the footnotes in your report, you personally read the study, is that fair?

A. No. If I personally cited the -- if I personally cited the study, then I read the report. If Dr. Teeter cited the

study, then he read the report, or the study. Sorry, if he cited it in the -- information that I had, in a paragraph, for example, then it was something that he read. I might then have reviewed the study that he reviewed as well.

Q. So in the -- in your reports that we were discussing today, for your kidney cancer and Parkinson's Disease, would it be correct to say that there are studies cited in the footnotes of those reports that you haven't reviewed?

A. Yes, there would be some that I've not read an extense of.

Q. And for those studies, did you rely on Dr. Teeter's interpretation of the study results?

A. No, they're not interpreted -- they're abstracted, but not interpreted.

Q. Did you rely on Dr. Teeter's abstraction of those study results?

A. In some cases, yes.

MS. SILVERSTEIN: And I think I am done with my questions.

THE WITNESS: All right.

MS. SILVERSTEIN: Thank you so much for your time today, Doctor.

MR. SNIDOW: Just a brief redirect.

THE WITNESS: Nope, I'm leaving.

MR. SNIDOW: Good.

J.J. Snidow on behalf of the plaintiff leadership group.

EXAMINATION

BY MR. SNIDOW:

Q. Dr. Freeman, thank you for your time today. Just a few follow-up questions.

First, I think earlier in the deposition, when referring to a Parkinson's study, you said the Goodman study a couple of times. Am I right that you meant the Goldman studies?

A. Yes.

Q. Thank you.

I think earlier in the deposition you mentioned -- you were discussing with Ms. Silverstein the 95th

percent confidence interval.

Do you remember that?

A. Yes.

Q. And I think at one point you said that's the most commonly used measure of significance. Did you mean statistical significance?

A. Yes.

Q. And am I correct that a result can be statistically not significant but still provide evidence in favor of causation?

A. Without question.

MS. SILVERSTEIN: Objection.

A. Sorry.

BY MR. SNIDOW:

Q. You were asked by Ms. Silverstein whether a risk ratio of 1.2 would be characterized as a modest association. Do you remember that?

A. Yes.

Q. Can modest association still be causal?

A. Absolutely.

Q. Ms. Silverstein asked you about dose-response, in particular whether certain

results were monotonically dose-response.
Do you remember that?
A. Yes.
Q. If there's a dose-response relationship but it's not monotonic, can that provide evidence in favor of causation?
MS. SILVERSTEIN: Objection.
A. It can.
BY MR. SNIDOW:
Q. Ms. Silverstein asked you whether you performed a risk assessment. Are you a risk assessor?
A. Not in the way that she was asking.
Q. Okay. Did you rely primarily on epidemiology rather than theoretical modeling of risks?
A. Yes. It's a very loose use of risk. Results of the studies that I performed and the forensic analyses that I do are often characterized in terms of risk, or risk ratios or odds, and odds ratios, which are a form of risk. So it's a bit -- it's a term that has specific meaning coming from my discipline.

But once she clarified what she was referring to, that is far outside of the area that I work in.

Q. On a few occasions you mentioned to Ms. Silverstein that certain site designs would bias the results toward the null. Could you explain what you mean by that?

A. Yes. If, for example, as described in the Bove and Goldman studies, there are mixed in with the Camp Lejeune, the quote, exposed group, there are people who are not exposed or they're less exposed, then you're diluting the effect of actually being exposed. So that biases the difference in risk towards 0, which is another term for the null.

Q. So when there is bias toward the null in a study, will that make the results appear stronger or weaker than they are in reality?

MS. SILVERSTEIN: Objection.

A. Weaker.

MR. SNIDOW: Thank you.

BY MR. SNIDOW:

Q. What's a point estimate?

A. That is the single estimate of risk or relative risk or odds ratio around which a confidence interval is bracketed.

Q. Am I correct that the point estimate is the best estimate being provided by a study regardless of how big the confidence intervals are?

MS. SILVERSTEIN: Objection.

A. Yes, you always have to start with a point estimate.

BY MR. SNIDOW:

Q. You were asked on several occasions whether confidential intervals were wide or not. Is that kind of a subjective judgment?

A. Generally it is.

I think that the questions that I -- where I was asked about confidence intervals, and whether I would consider them wide, would be generally deemed to be wide, however.

Q. Some of them were quite large?

A. Yes.

Q. But am I correct, there's not -- there's not a set standard for when a confidence interval is, quote/unquote, wide?

A. Correct. The confidence interval ratio, for example, of three, is relatively narrow. Four is not what I would consider wide, but ten, I would expect, would generally be considered wide.

Q. And I think Ms. Silverstein asked you about some that were on the rate of 30, maybe?

A. Yes.

Q. Ms. Silverstein asked you a number of questions about whether studies had controlled for various risk factors. Do you remember that?

A. Yes.

Q. And I believe she asked you about well water, obesity, traumatic brain injury, family history, smoking, and maybe a couple of other ones I missed.

A. Yes.

Q. Do you remember that conversation?

A. Yes.

Q. In the study, you know what confounding is?

A. I do.

Q. For a risk factor to lead to confounding in a study, what conditions need to be true?

A. Well, it has to be associated with both the exposure and the outcome.

Q. And in any of the studies that she mentioned, was there any evidence, for example, that the people in the study who got kidney cancer had been exposed to more well water?

MS. SILVERSTEIN: Objection.

A. No. Nor is there evidence -- is there any evidence that that rate of exposure, of well water as a child, for example, there is any difference between -- difference between Camp Pendleton and Camp Lejeune.

BY MR. SNIDOW:

Q. That was my next question. For obesity, traumatic brain injury, family history, any other risk factors, any evidence in the literature that those risk factors are

distributed differently in the Camp Lejeune population than they are in the Camp Pendleton population?

MS. SILVERSTEIN: Objection.

A. Not that I'm aware of.

BY MR. SNIDOW:

Q. All right. Ms. Silverstein asked you a variety of questions about threshold dose, and I believe you said that nobody has detailed information -- excuse me. Strike that.

I believe you said that nobody has detailed enough information about how much TCE is needed to cause kidney cancer. Do you remember that?

A. Yes.

Q. Were you suggesting that there is a threshold dose for TCE and kidney cancer?

A. There may be, it's just never been defined.

Q. And at the levels we're operating here at Camp Lejeune, based on your review of the literature, is there any indication that we are below the threshold or

anywhere near that?

A. No.

MS. SILVERSTEIN: Objection.

BY MR. SNIDOW:

Q. You were asked about whether you reviewed individual papers underlying one of the meta-analyses.

Do you remember that?

A. Yes.

Q. What's the purpose of a meta-analysis?

A. It is to review -- it's a study of studies. The purpose is to evaluate and if possible pool information from a number of different studies to strengthen the conclusions set from a statistical perspective.

Q. You were asked about the Goldman 2012 twin study. Do you remember that?

A. Distinctly.

Q. Yes. Was there any suggestion in that study that the various risk factors Ms. Silverstein identified were more common in the twin who had been exposed to PC or

TCE?

MS. SILVERSTEIN: Objection.

A. No, none at all.

BY MR. SNIDOW:

Q. And given that -- strike that.

You were asked questions about the Goldman 2012 study. Do you remember that?

A. Yes.

Q. And Ms. Silverstein was asking you questions about whether there were only five and nine test cases in the study. Do you remember that?

A. Yes.

Q. Here's my question: Is it correct to say that the Goldman 2012 study only included five or nine people in the study?

A. No.

MR. SNIDOW: Almost done.

BY MR. SNIDOW:

Q. Ms. Silverstein asked you about whether you had seen the phrase "as likely as not" in the peer-reviewed literature. Do you remember that?

A. Yes.
Q. Have you seen the word equipoise in the peer-reviewed literature?
MS. SILVERSTEIN: Objection.
A. No. It doesn't really pop up in the literature that I reviewed, anyway.
BY MR. SNIDOW:
Q. Okay.
A. I'm not saying that it hasn't appeared in the literature, other than the literature we're talking about, of course.
Q. Sure.
A. But no, it's not something that I've been familiar with in the past, and -- at least in the kind of epidemiologic studies I typically review or write or edit.
MR. SNIDOW: Okay. No further questions.
MS. SILVERSTEIN: I don't have anything further. Thank you again for your time today, Dr. Freeman.
THE VIDEOGRAPHER: This concludes the video deposition. We are off the record at 4:27 p.m.
(Time noted: 4:27 p.m. PDT)

C E R T I F I C A T E

I, DEBRA A. DIBBLE, RDR, CRR, CRC, Notary Public, do hereby certify:

That MICHAEL D. FREEMAN, MD, PhD, MScFMS, MPH, the witness whose deposition is hereinbefore set forth, was duly sworn by me and that such deposition is a true record of the testimony given by such witness;

That pursuant to FRCP Rule 30, signature of the witness was not requested by the witness or other party before the conclusion of the deposition;

I further certify that I am not related to any of the parties to this action by blood or marriage, and that I am in no way interested in the outcome of this matter.

IN WITNESS WHEREOF, I have hereunto set my hand on this 26th day of June, 2025.

_____

Debra A. Dibble
Fellow of the Academy of Professional Reporters
Registered Diplomate Reporter

I HEREBY CERTIFY that I have read this transcript of my deposition, and that this transcript accurately states the testimony given by me, with the changes or corrections, if any, as noted.

X _____

MICHAEL D. FREEMAN, MD, PhD, MScFMS, MPH

ERRATA SHEET FOR THE TRANSCRIPT OF:

CASE NAME: In Re: Camp Lejeune Water Litigation

DEP DATE: June 17, 2025

DEPONENT: MICHAEL D. FREEMAN, MD, PhD, MScFMS, MPH

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MICHAEL D. FREEMAN, MD, PhD, MScFMS, MPH

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