

POLLUTION CONTROL HEARINGS BOARD
STATE OF WASHINGTON

WASHINGTON STATE DAIRY FEDERATION,)
the WASHINGTON FARM BUREAU, PUGET)
SOUNDKEEPER ALLIANCE, COMMUNITY)
ASSOCIATION FOR RESTORATION OF THE)
ENVIRONMENT (CARE), FRIENDS OF) PCHB No. 17-016(c)
TOPPENISH CREEK, SIERRA CLUB,)
WATERKEEPER ALLIANCE, CENTER FOR)
FOOD SAFETY, and RESOURCES FOR)
SUSTAINABLE COMMUNITIES,)
)
Appellants,)
)
vs.)
)
STATE OF WASHINGTON, DEPARTMENT OF)
ECOLOGY,)
)
Respondent.)

HEARING
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1 BE IT REMEMBERED that on Friday,
2 May 25, 2018, at 1111 Israel Road SW, Olympia,
3 Washington, at 8:58 a.m., before ANDREA L. CLEVINGER,
4 CCR, RPR, the following proceedings were had, to wit:

5

6 <<<<<< >>>>>>

7

8 JUDGE FRANCKS: So thank you for your
9 estimates yesterday and for reporting the chess clock
10 time that I neglected to collect.

11 I would like to keep using the chess clock, and
12 after today, what we're going to do is, we will reconvene
13 on June 5th, and it appears to me that we should be able
14 to get done by later in the day June 6th or possibly the
15 7th.

16 So that's where we're going to go from here. I
17 think that's all I wanted to tell you.

18 Any other housekeeping issues this morning,
19 Ms. Barney?

20 MS. BARNEY: Judge Francks, I believe
21 in our letter to you a couple weeks ago, when we were
22 talking about those dates, I indicated that Mr. Jennings
23 is not available --

24 JUDGE FRANCKS: Yes, you did.

25 MS. BARNEY: -- during those dates,

1 and if I need to call him on rebuttal and we're on dates
2 that he's not available --

3 JUDGE FRANCKS: We could add another
4 date if we needed that. So let's talk about that when
5 we're back.

6 MS. BARNEY: Okay.

7 JUDGE FRANCKS: But you're right. I
8 will not eliminate that option for you at all.

9 MS. BARNEY: Thank you.

10 JUDGE FRANCKS: I'll make it happen.
11 Anything else?

12 MR. TEBBUTT: Just for people's
13 information, we're going to -- when Mr. Erickson is done,
14 we'll try to get Mrs. Reddout on the phone.

15 JUDGE FRANCKS: So we're going to
16 finish Mr. Erickson first.

17 MR. TEBBUTT: Yes.

18 JUDGE FRANCKS: Gotcha. Okay.
19 Anything else? All right. So we'll go off the record
20 for a second. I'll go get the board.

21 (Pause in the proceedings.)

22 (Board members enters.)

23 JUDGE FRANCKS: Have a seat. Let's go
24 on the record. We are here on Day 5, and I understand
25 that we are going to finish up with Mr. Erickson, so I

1 believe Ms. Howard was asking questions as we ended
2 yesterday.

3 Please proceed.

4 CROSS-EXAMINATION (Continuing)

5 BY MS. HOWARD:

6 Q Good morning, Mr. Erickson.

7 A Good morning.

8 Q Nice to see you again this morning. So I -- just kind of
9 a few more things here I want to cover and then we'll be
10 done.

11 So yesterday we were talking a bit about the -- what
12 I'm calling the Haak data, the data from the Haak lagoon,
13 and we actually had that data too, in I-22.

14 So if we could look at I-22, it's just kind of a --
15 you can go to the next page there. I-22.

16 MS. NICHOLSON: I-21.

17 MS. HOWARD: Page 6.

18 JUDGE FRANCKS: That's the PDF page.

19 Q (By Ms. Howard) And you probably can answer this
20 question without looking at it. It's just nice sometimes
21 to have a visual.

22 So when we were talking yesterday, you had confirmed
23 that this -- that we didn't have soil moisture data for
24 this -- along with this chart; is that correct?

25 A I'd have to look back at the lab sheets. I didn't report

1 it in the table.

2 Q Okay.

3 A I don't really remember.

4 Q You don't remember if you collected it or not?

5 A Correct.

6 Q Is it normal to not have the soil moisture data collected
7 when you're taking a soil sample like this?

8 A I guess I wouldn't say it's not normal or abnormal. It's
9 one of the things you ask for or don't.

10 Q Okay.

11 A So I think we did moisture on almost all of the samples,
12 so I believe, if we went back to the lab data, there
13 would be soil moisture in this one.

14 Q But we just don't have it in the report?

15 A Correct.

16 Q Okay. Wouldn't soil moisture -- you said that nitrates
17 more tightly bind to the water; correct?

18 A Correct. They move in the water instead of the -- being
19 bound to the soil.

20 Q Okay. So this is soil data, but this is not information
21 about the nitrates in the water then?

22 A It is. Can you give me a reference so I can look at it?

23 Q Yeah.

24 MS. NICHOLSON: It's I-21.

25 Q (By Ms. Howard) I-21, Page 6. Sorry. I didn't give you

1 enough time to flip to it. It's just the excerpt from
2 your report that includes this data.

3 A Okay. So --

4 Q That's okay.

5 A Your question was --

6 Q You actually answered my question.

7 So I think the other -- I guess the question or
8 concern I have is whether or not we're actually able to
9 determine from the soil data whether nitrates are moving
10 to groundwater.

11 If we don't actually have the nitrates in the water,
12 how do we know that this indicates there were nitrates
13 going to groundwater? We don't, do we?

14 A So you do have the data for nitrate in water in this
15 table.

16 Q Well, how is that possible when we don't actually have
17 information about the nitrates in the groundwater -- or
18 in the water from this table?

19 A Okay. So these are soil analyses, so we take a soil
20 sample and send it to the lab.

21 Q Right.

22 A They analyze it. We know that the ammonia is bound to
23 the soil, but the nitrate moves in the soil moisture.

24 Q Exactly.

25 A So when they do that analysis, they're analyzing

1 everything in the sample. So based on the data that we
2 have, we know what the concentration of nitrate is.

3 Q In the soil, but not in the water; correct?

4 A When they do the analysis, they analyze the water too.

5 Q But you didn't provide that information in your report,
6 did you?

7 A I didn't provide the moisture content --

8 Q Okay.

9 A -- of the soil.

10 Q Okay. All right. So -- and, again, this is the only
11 information that we have -- only soil sample that we have
12 from beneath a lagoon in your report; correct?

13 A That is correct.

14 Q Okay. And -- but this also -- this particular lagoon is
15 not within the area where we have the groundwater
16 monitoring data. Is that also correct?

17 A Yeah. This is outside the cluster.

18 Q Okay.

19 A Correct.

20 Q But you relied on this data to draw a determination that
21 there was contamination occurring within the other --
22 within the groundwater monitoring area?

23 A Correct.

24 Q Okay. But you don't actually have any groundwater
25 monitoring data correlated to this particular soil

1 sample?

2 A That is true.

3 Q Okay. And with regards to the calculations that you did
4 within the groundwater monitoring area, within the
5 cluster area, you didn't actually collect information
6 about the permeability of those liners, did you?

7 A We weren't allowed to, no.

8 Q So any analysis that you did about whether or not those
9 lagoons were leaking to groundwater would have been based
10 upon estimates or assumptions?

11 MR. TEBBUTT: Objection. Asked and
12 answered. We're going over old ground from yesterday.

13 JUDGE FRANCKS: I'm going to overrule
14 that. I don't remember that.

15 A It's based on the data that we were given by the dairy.
16 They said the lagoons were completed according to NRCS
17 standards.

18 Q (By Ms. Howard) But when we spoke yesterday, you
19 confirmed that you weren't able to confirm that; correct?

20 A That is correct.

21 Q Okay.

22 A And, again, we weren't allowed to confirm that. We
23 weren't allowed to core the liner on the clustered area,
24 so --

25 Q Yeah. I get that, but the concern still is then you

1 don't actually have hard data to do your analysis. Isn't
2 that true?

3 Whether you were allowed to do it or not, you still
4 didn't have actual data about the liners to do your
5 analysis?

6 MR. TEBBUTT: Objection.
7 Mischaracterizes testimony.

8 MS. HOWARD: It was a question.

9 JUDGE FRANCKS: Well, let's let him
10 answer the question.

11 A We did. We had information from the dairies that told us
12 how the lagoons were completed, and they were completed
13 similar to the Haak.

14 So it's an example of what we -- what we -- how the
15 dairy cluster lagoons should have been completed if they
16 were completed the way that dairies told us they were
17 completed, but we weren't allowed to actually core the
18 liner and test it on the clustered areas.

19 Q (By Ms. Howard) In order to confirm?

20 A Correct.

21 Q Okay. And on the Haak lagoon was a lagoon that had been
22 decommissioned, correct, or it was no longer in use? How
23 about that?

24 A Yeah. It was dry and the manure had been scraped out of
25 it.

1 Q And so we also don't know anything about the liner on the
2 Haak lagoon either, do we?

3 A We cored through the liner when we took the soil samples.

4 Q But if it had been scraped and some of it removed, we
5 don't actually know what the liner was on that lagoon, do
6 we?

7 A So you want me to assume that the liner had been removed
8 before we cored it or --

9 Q Well, you just said it had been scraped and cleaned, and
10 so we don't actually know what the condition of that
11 liner was prior to that, do we?

12 A While we were on-site, we still saw the areas where there
13 was manure in the liner. I mean, it's very difficult to
14 completely clean all the manure out.

15 So there's pictures in my report of the -- what the
16 Haak liner looked like when we did the core, if that's
17 what you're looking for. And what we saw under the
18 manure was basically a native soil with sand, gravel, and
19 silt in it.

20 Q And did you take any tests about permeability related to
21 that layer?

22 A Again, we were not allowed to do that.

23 Q Okay. So -- but you are relying on this information to
24 say your opinion is that, in particular, in contrast with
25 NRCS constructed lagoon that you would expect these sorts

1 of conditions to occur -- these groundwater conditions to
2 occur even under a NRCS constructed lagoon based upon
3 this data?

4 MR. TEBBUTT: Your Honor, if I may,
5 I'm going to object on relevance grounds. This is beyond
6 the scope of direct as well. We didn't discuss the Haak
7 lagoon at all on direct.

8 And I think Ms. Howard is spending an awful lot of
9 time on something that we didn't rely on in any
10 particular great way and is not in evidence in this case
11 in any great way.

12 JUDGE FRANCKS: Well, this is part of
13 his expert report.

14 MR. TEBBUTT: True. But, I mean, we
15 didn't do anything on direct on this.

16 JUDGE FRANCKS: Well, I think that --
17 to the extent that he's relying on it for his expert
18 opinion, I think that it's -- it's something that they're
19 entitled to inquire about. So I'm going to allow it.

20 A Can you re-ask the question?

21 Q (By Ms. Howard) You bet. You bet. So I think your
22 opinion is that all lagoons leak; is that correct?

23 MR. TEBBUTT: Objection.
24 Mischaracterizes testimony.

25 A No. I think, you know, over the course of the last day

1 we've talked about --

2 JUDGE FRANCK: I think it's a
3 question.

4 A -- a couple lagoons that I'm aware of that don't leak.

5 Q (By Ms. Howard) All earthen lined lagoons leak. Is that
6 your opinion?

7 A That is correct, yes.

8 Q Okay. And, in particular, I think you did talk about
9 NRCS lagoons, and you said all NRCS lagoons leak; is that
10 correct?

11 A I believe so, yes.

12 Q Okay. And by inference then, your opinion is that all
13 earthen lagoon lines -- I can't say that many words in a
14 row; I'm sorry -- all earthen lined lagoons also
15 contaminate groundwater. Is that also your opinion?

16 A There's -- there may be situations out there where that's
17 not the case, but, in my experience, if the lagoon is
18 leaking and it contains a contaminant, the contaminant
19 does end up in groundwater, yes.

20 Q And for this case, you're relying on this data, the Haak
21 data, the estimates that you made about the lagoons at
22 Cow Palace, to say that dairy lagoons -- dairy earthen
23 lagoons also always leak and also always cause
24 contamination; is that correct?

25 A Well, this is -- the Haak boring would be one data point

1 of many that I relied on to say dairy lagoons leak.

2 Q But for purposes of the report, it's the only data point
3 we have; correct?

4 A I believe it's the only soil sample we collected, but
5 there's references to the Dennis Erickson studies that
6 showed that they leak.

7 Q But --

8 A Basic hydrogeology that tells you that water moves
9 through a ten to the minus six liner.

10 Q Leaking --

11 A So this is one data point. It seems like you're asking
12 me, is this all I relied on and that there's more to it
13 than just this one data point.

14 Q And you're willing to take that position notwithstanding
15 the fact that we do have testimony from NRCS that they've
16 also studied lagoons, animal waste impoundments, earthen,
17 for 30 years, and their research science experience
18 doesn't necessarily dispute that lagoons seep, but
19 certainly disputes that those lagoons are causing
20 contamination to groundwater at both the drinking water
21 level?

22 You're willing to take this data and your experience
23 and discount NRCS's experience and have the opinion you
24 have in this case?

25 MR. TEBBUTT: Objection. Compound,

1 misstates testimony, and counsel is testifying once
2 again.

3 JUDGE FRANCKS: Yeah. Can we
4 rephrase?

5 Q (By Ms. Howard) Mm-hm. Sure.

6 Do you disagree with NRCS that -- and Mr. Reck's
7 testimony in particular that -- that lagoons constructed
8 to NRCS standards are actually protective of groundwater?

9 A Do I disagree that NRCS constructed lagoons are --

10 MR. TEBBUTT: Your Honor, I'm going to
11 object for lack of foundation. I don't think there's
12 been any foundation laid that Mr. Erickson has even
13 reviewed Mr. Reck's testimony.

14 Q (By Ms. Howard) Have you reviewed Mr. Reck's testimony?

15 A I don't believe I have.

16 Q Were you here the other day when I was asking questions
17 of Ms. Redding?

18 A I was.

19 Q And discussed that information with her?

20 A I was here, yes.

21 Q Okay. Would you disagree with that opinion from NRCS?

22 A I would disagree with that opinion.

23 Q Okay. Let's look at A-67. I was trying to ask you a
24 question about this yesterday, and I really fumbled, so
25 I'm going to give it another shot.

1 Page 187. And when we were looking at -- when you
2 were looking at this yesterday with Mr. Tebbutt, you were
3 talking about phosphorous, and I think you had said --
4 and correct me if I get this wrong -- something along the
5 lines that phosphorous is normally high when your
6 nitrates are high.

7 Is that -- am I remembering that correctly?

8 A I think in reference to this figure, I said that if we
9 actually map our nitrate plume, that phosphorous
10 generally is high, consistent with that nitrate plume,
11 yes.

12 Q Oh, just with the plume, not with the actual monitoring
13 data?

14 A The plume itself is based on the monitoring data.

15 Q Okay.

16 A So --

17 Q All right.

18 A In general, I think we're talking about the same thing.

19 Q Okay. All right. Sorry again. Lawyer terms.

20 So I just took a quick look at some of this data,
21 and I just wanted to draw your attention to it.

22 So the top right-hand box, YBD-02.

23 A Yes.

24 Q And so this time I think I'm going to get the nitrate
25 correct. The NO₃, that's nitrate?

1 A That's correct.

2 Q Okay. And I see there it says 5.4 in Quarter 1?

3 A Yes.

4 Q And then P is phosphorous?

5 A That's correct.

6 Q And it says .099?

7 A Yes.

8 Q Okay. And then look down at DC-09, which is two boxes
9 lower. And there we have nitrate at 5.4 in Quarter 1?

10 A Correct.

11 Q And phosphorous at .024?

12 A Yes.

13 Q So just looking at those two boxes, that doesn't appear
14 to be tracking the trend that you were talking about.
15 The phosphorous is not high when the nitrates are high.
16 In fact, it appears that these are -- they're high
17 sometimes and low sometimes.

18 Is that consistent with your opinion?

19 A So you can't just look at two boxes.

20 Q Okay. Let's --

21 A You have to look at the complete picture.

22 Q All right. So let's look at --

23 A What we know is that the high nitrate plumes that's right
24 in here kind of in the middle of the dairy cluster, we
25 also know, based on groundwater flow, it's moving this

1 direction. (Indicating.)

2 Q Okay. Well, let's look at some of those.

3 A Two other data points that are very important.

4 Q All right. Well, let's look at those. Let's look at
5 DC03, which is right down there.

6 MR. TEBBUTT: Would counsel,
7 Ms. Howard, please let him finish his answers.

8 JUDGE FRANCKS: Yeah. People can't
9 talk over each other.

10 MS. HOWARD: I'm sorry.

11 A So based on the nitrate data, if we drew contours, this
12 is the same graph as we showed yesterday, the rabbit
13 figure I think she referred it to, where we had the
14 hot -- the high concentration area right in here.
15 (Indicating.)

16 So if we start looking at our higher phosphorous
17 concentrations and you look at YVD-10, which is this box
18 right here -- I'll help everybody because it's tough to
19 see -- we've got concentrations of .066 and this one is
20 .074. (Indicating.)

21 If we look out around the edges, we've got
22 concentrations of 18s, low teens. So the -- so my
23 statement was, in general, in the area where the higher
24 nitrate is, you have higher phosphorous and you'd expect
25 that because these wells here are more affected by

1 irrigation practices where they're applying these
2 nutrients to the fields. Whereas, the wells around the
3 edges are not as affected by irrigation.

4 And the other big point is, we start looking out on
5 the edge like she's talking about where -- I think it was
6 YVD-02, the top one that is .9, you're up into a
7 different aquifer, if you will.

8 You're up on the rattlesnake ridge, which is
9 basically closer to the bedrock, and the wells are
10 completed right on top of bedrock.

11 So you've got a little different water chemistry.
12 So the -- the nitrate plume interpretation is very clean.
13 The data is very certain.

14 The phosphorous data is more just general trends.
15 It's a little surprising. Again, we don't expect to see
16 phosphorous in groundwater. All the data tells us that
17 phosphorous is absorbed in the soil.

18 And when we do start seeing increases in phosphorous
19 in groundwater, it's a little -- it's surprising to me as
20 a scientist because we've looked at the chemistry of
21 phosphorous, and we believe it's absorbed in the soil.

22 But it looks like in these cases where you've
23 applied a lot of nitrogen, a lot of phosphorous, a lot of
24 irrigation water, that we're actually flushing some phos
25 through under these sites.

1 Q And my question I think was just to clarify that there's
2 not always a clear correlation between the two. So you
3 pointed to that particular box. Let's look at DC-14.
4 This is, again, the data that you're relying on.

5 That also is kind of within that area that you
6 pointed to that was orange; correct?

7 A Correct.

8 Q And so here we have nitrate that's 4.34, phosphorous
9 that's .074, which is actually higher than the one that
10 you were just pointing to below.

11 So there doesn't seem to be really that direct of a
12 correlation at least from this data. Is that true?

13 A So DC-14 sits right between -- sits on the road right
14 between two lagoons on Cow Palace.

15 So there's also a really good chance that you've got
16 a high phos load from the lagoon seepage on that -- in
17 that location.

18 Q So there's -- but there isn't a -- doesn't appear to be a
19 correlation if you look at those two boxes; correct?

20 We've got different -- there's not a direct
21 correlation between nitrate and phosphorous. We're not
22 seeing a pattern here, are we?

23 A Correct. And that's what I said is a general
24 correlation.

25 Q Okay.

1 A That's what I said in my testimony earlier.

2 Q Thanks for clarifying that.

3 A You bet.

4 Q Okay. Can we look at Page 23. So I noticed in your
5 testimony yesterday with Mr. Tebbutt that we talked about
6 the monitoring wells, but didn't get a lot into trends.

7 Is this -- have you reviewed this Page 23 in the QEA
8 report -- draft QEA report?

9 A I have.

10 Q And does it actually establish a trend with regards to
11 groundwater?

12 A Does it establish a trend? I think it talks about
13 several different trends going on at the site.

14 Q That are at odds with each other? So --

15 A I don't believe they're at odds with each other. It's
16 all part of the interpretation at the site.

17 Q But there's not a consistent trend up or down or stable
18 in all of the wells; is that correct?

19 A So I think this is better illustrated if you go to
20 Page 191 in the same exhibit. And really what we have is
21 91 -- or 191 -- excuse me -- 192, 193, 194, these are --
22 these are actually trend analysis.

23 So if you look at Page 191, this is a group of wells
24 from the previous figure we looked at, and this is
25 groundwater monitoring data over time.

1 So in this instance, you can see that some of the
2 wells, such as the one in purple, which is YVD-15, is
3 showing a decreasing trend, and some of the wells are
4 showing what we call stable trends.

5 You can see the groundwater MCL line here down at
6 10. These wells are well above the MCL. So in this area
7 we're seeing some wells that are decreasing, some wells
8 that are increasing.

9 But if you turn to Page 192, you can see well DC-03,
10 and, again, this is the one that's downgradient from the
11 Bosma lagoons.

12 From about 2015 on, we're seeing a pretty steeply
13 decreasing trend, so that would indicate that we've got
14 lagoon leakage in that area.

15 If you turn to Page 193, it looks like there's more
16 increasing wells in this situation. So YVD-11, which is
17 in blue, shows a pretty steeply increasing trend.

18 And YVD-08 in yellow are actually orange right here.
19 Shows a pretty steeply increasing trend. So this is just
20 part of the data that you collect to monitor the
21 performance of the remediation or the corrective measures
22 you're implementing at the site.

23 So the reason we're collecting it is, as we line
24 lagoons and as we decrease the load to the application
25 fields and as we repair the underground piping and change

1 the compost operation to drain quicker, we expect these
2 trends to start decreasing.

3 So we're looking for performance in the groundwater
4 for more corrective measures. So that's --

5 Q How many -- sorry.

6 A That's why you collect the data and look at the trend.
7 If you actually turn to the next page, which is 194,
8 these are all upgradient wells.

9 So, again, the MCL showing right here is 10. You
10 can see the upgradient wells are -- well, recently are
11 all below that MCL well, but wells on-site and the wells
12 downgradient are either above the MCL or showing a trend
13 in nitrate concentrations, so --

14 Q That's okay.

15 A To summarize, this is why you do groundwater monitoring,
16 in order to answer that question, is my liner leaking?
17 Am I impacting groundwater? Is my application correct?
18 Should I reduce my application to reduce the impacts to
19 groundwater?

20 Q How many years have you been taking data so far?

21 A This started in 2013.

22 Q And have you actually been able to see -- answer that
23 question yet?

24 A We have not.

25 MS. HOWARD: Okay. Thank you.

1 Your Honor, I think that's all of my questions.

2 Thank you.

3 JUDGE FRANCKS: Okay. Redirect?

4 MR. TEBBUTT: Thank you. I have a
5 little redirect, but I'll just do it from here just to
6 make it easier.

7 REDIRECT EXAMINATION

8 BY MR. TEBBUTT:

9 Q Sir, just a few moments ago, you were talking about
10 Page 192 in A-67. And you were talking -- you were
11 looking at the top -- I believe the top graph or line in
12 the graph that's reflected on 192, and I believe you said
13 that there was a decrease in trend.

14 Did you misspeak?

15 A I did. I'm sorry. The point I was trying to make is
16 that, from about 2015, the end of 2015 on, we're seeing
17 an increasing trend in the groundwater data.

18 And just for a little background, what we know is
19 that about -- in about that date, the closest lagoon to
20 this monitoring well was the manure was removed from this
21 lagoon, again, with a large front-end loader.

22 We were actually on-site when this happened, and you
23 could see the front-end loader digging the manure out and
24 removing the soil underneath it at the same time.

25 So that's my -- that was my point earlier about how

1 do you maintain these silt liners when they have to clean
2 the manure out every couple years.

3 Q Let me stop you there. So you're saying at the low point
4 the lagoon was empty? I think you were pointing at the
5 low point.

6 A Yeah.

7 Q Right there?

8 A Would have been right in this late '15 data.

9 Q And since then, the lagoon has been refilled?

10 A Correct.

11 Q Okay. You were also asked by Ms. Howard about the Haak
12 study. That was one data point; correct?

13 A Yes.

14 Q And that's all that was allowed by agreement between the
15 parties, just one boring hole in the lagoon; right?

16 A Yes. That's true.

17 Q And that lagoon was multiple acres?

18 A It was. It was probably a five-to-seven-acre lagoon. It
19 was a large lagoon.

20 Q Okay. In addition to the Haak data, you relied on lots
21 of other data to form your opinions in the Cow Palace
22 case; correct?

23 A Correct. And that's what I was stating, is that that's
24 one data point in many.

25 Q All right. And so the EPA study that went on for two and

1 a half years was one of the documents you relied on;
2 correct?

3 A Yes. That was -- that was very important to our overall
4 study, the background data that was collected there.

5 Q Right. And the groundwater data that's been collected
6 since 2013 is part of your opinions in this case;
7 correct?

8 A It is, yes.

9 Q And I believe you also were asked, again, that based on
10 your history of investigations of earthen lagoons, I
11 believe you said that you've never seen an earthen lagoon
12 that had contaminants in it that didn't pollute the
13 groundwater below it; correct?

14 A The only reason I hesitate on that question is, there's
15 situations where we have done a lagoon lining or a
16 clean-out and relining where we don't have groundwater
17 data.

18 So in my professional experience, if we're working
19 on an earthen lagoon and we actually have the groundwater
20 monitoring data, every time that that situation occurs,
21 we see contaminants in the groundwater from that lagoon.

22 Q Where you have groundwater data?

23 A Correct.

24 Q Okay. Yesterday you were asked a question about -- about
25 the applicability of your observations in the Lower

1 Yakima Valley and opining about the general state, if you
2 will, of conditions across the state of Washington in
3 dairy lagoons.

4 Do you remember that discussion?

5 A I do.

6 Q And in addition to the data that you've seen in the
7 Yakima Valley, are there other documents that you relied
8 on to form that opinion?

9 A Yes. There's many documents. It's a fairly exhaustive
10 list. I think there's a list of CAFO-specific references
11 in the back of my expert report.

12 Q Right.

13 A There's a ton of study done by the State of Washington on
14 nitrate infused on dairy lagoons, so it's not -- it's not
15 just the -- my experience with the dairy cluster,
16 although I do believe that the data collected there is
17 probably the most comprehensive data set in the state.

18 Q Right. And perhaps in the United States, from what
19 you've seen; correct?

20 A Correct.

21 Q And did you also review summaries that came from State
22 files of discharges from other facilities around the
23 state?

24 A I have, yes.

25 Q I'd like you to take a look at Exhibit 24, please, A-24.

1 It's in our -- sir, have you seen the document that is
2 marked as Exhibit A-24 before?

3 A I have seen this. It's been about probably two years
4 ago, though.

5 Q Okay. Is this a document that you relied on -- one of
6 the documents and some of the information you relied on
7 in making your assessment that dairy operations in --
8 throughout Washington are similar?

9 A It is information I relied on. I think we had this same
10 type of information for the Lower Yakima Valley where
11 there was quite a few discharges that were documented in
12 the regulatory record.

13 Q And so, for instance, No. 8, on Page 3 of Exhibit 24, do
14 you see the beached lagoon?

15 A Breached lagoon?

16 Q Well, it says beached, but --

17 A Oh, No. 8. Excuse me. Yep.

18 Q We'll assume that means breached. Is that your
19 understanding?

20 A Yes.

21 Q Because then No. 9 right below it, Dan Noteboom's dairy,
22 it says, "Dike breached during Nooksack flooding."

23 Do you see that?

24 A I do.

25 Q You never heard of a beached lagoon before, have you?

1 A I have not.

2 Q So these kinds of -- and is it your understanding that
3 these were documents that came from State records?

4 A Yes, it is.

5 Q And there are a whole list of types of discharges that
6 are listed there?

7 A Yes, there are.

8 Q And that's for all different parts of the state, isn't
9 it?

10 A It appears to be, yes.

11 Q And there are some -- looks like list of 24 for the --
12 sorry -- 18 for Whatcom County; right?

13 A Yes, there are.

14 Q And some five for the north NWRO, which we'll -- is that
15 the northwest regional office?

16 A There are five there, yes.

17 Q Okay. And then there's some for CRO, central regional
18 office?

19 A Correct. Two.

20 Q And it has a couple other regional offices there as well;
21 correct?

22 A Yes.

23 MR. TEBBUTT: Okay. Again, Your
24 Honor, we'd move A-24 into evidence.

25 MS. BARNEY: Objection. You know,

1 he's stating what it appears to be. It doesn't --
2 there's no -- there's still no foundation for the source
3 of this document other than, quote/unquote, State
4 records.

5 JUDGE FRANCKS: I don't think you've
6 established the foundation of this.

7 MR. TEBBUTT: All right. Well,
8 we'll -- in the intervening week, we'll get a
9 certification from the State that this is one of their
10 documents because we assert that this is a public record,
11 and it's admissible under the exception to hearsay rule
12 because it's a public record prepared by the State.

13 It's a summary of discharges that have been compiled
14 by State agencies, so, therefore, will be admissible, and
15 we'll get a certified copy of it in the meantime.

16 MS. BARNEY: But if I may, that
17 exemption requires it to be a public record kept in the
18 usual course of business, which usually refers to a
19 particular form that is filled out in a particular way.

20 This appears to be an individualized document that
21 doesn't meet the requirements of the evidentiary rule.

22 MR. TEBBUTT: Not at all true because
23 these are summaries of large volumes of information.

24 JUDGE FRANCKS: And we'll deal with
25 that when you produce that.

1 MS. HOWARD: Your Honor, I'm sorry.
2 We also wanted to object on relevance to this is data
3 from 2009. It appears that's not, again, related to the
4 issues before the board.

5 JUDGE FRANCK: Well, first, I haven't
6 admitted it.

7 MS. HOWARD: I know. I just wanted to
8 make sure I didn't miss that.

9 JUDGE FRANCK: When we see it again,
10 you can renew your objections.

11 MR. TEBBUTT: Your Honor, I will also
12 note these were attached to the CAFO comment, and so
13 these have been in the record -- in Ecology's records for
14 a long time. They came from Ecology's records. It's
15 stated as such in the comment records, so there's
16 foundation in there as well.

17 And those records -- and that the comment letters
18 are already in evidence.

19 JUDGE FRANCK: Well, I think we're
20 only talking about this document, so --

21 MR. TEBBUTT: For now, yes.

22 JUDGE FRANCK: I think I've ruled.
23 Let's carry on.

24 Q (By Mr. Tebbutt) Yesterday you were asked some
25 questions -- and I don't remember by whom -- about

1 monitoring wells and how you would use them to assess
2 whether a source is contributing to contamination.

3 Do you recall some of that testimony?

4 A I do.

5 Q And how would you -- or how many wells would you need
6 around a particular source -- let's say eight. Let's use
7 a lagoon, for instance.

8 How many groundwater monitoring wells would you need
9 around a particular lagoon at a minimum to determine
10 whether that source was contributing to contamination?

11 A So if you were talking about just a single lagoon or a
12 single application field, then you'd need at least one
13 upgradient well and two downgradient wells.

14 But when it's all part of a system where you're
15 collecting upgradient wells for the system, then a site
16 could have six or eight or ten lagoons, a compost area,
17 application fields.

18 And you could do that -- you could collect the data
19 you needed with -- I think I testified to up to eight
20 wells.

21 Q Right. Let me stop you there because my point is just
22 for a particular source for one particular lagoon or one
23 particular field, you'd need one upgradient and two
24 downgradient; correct?

25 A If you were just looking at that?

1 Q At any particular source.

2 A Correct.

3 Q Yeah. That was all. I just wanted to clarify.

4 Let's take a look at Figure 1 in A-2, please.

5 JUDGE FRANCKS: Do you have a page for
6 that?

7 MR. TEBBUTT: It's the very last page
8 of A-2. It's the map.

9 JUDGE FRANCKS: Page 35?

10 MR. TEBBUTT: Doesn't have a page
11 number on it, so it's Figure 1, so I believe it's, yes,
12 Page 35.

13 And if we could zoom in, this might be a little
14 tricky. Can you zoom in on the right side -- let's see
15 if I can point to it.

16 JUDGE FRANCKS: I'm going to turn some
17 lights off because I think that might help us.

18 MR. TEBBUTT: There we go. That's
19 perfect right there.

20 Q (By Mr. Tebbutt) Sir, the -- what I want to ask is: You
21 see where the number 85.6 is right there on the map?

22 A I do.

23 Q What is just above that?

24 A So this is the 85.6 right here.

25 Q Correct.

1 A Right above it is DeRuyter dairy.

2 Q Is that one of the two DeRuyter dairies, the DNA dairy?

3 A Correct. It's the southern dairy.

4 Q And what appears right above that? I mean, as part of
5 the DeRuyter dairy, can you describe -- you've been on
6 that site; right?

7 A I have.

8 Q A number of times?

9 A Yes.

10 Q And most recently -- that was, what, December of 2017?

11 A Correct.

12 Q That is an operating dairy; correct?

13 A It is.

14 Q And what are those features that look like impoundments?
15 Are those lagoons?

16 A So -- so directly above the well, I think I was asked
17 earlier about lines -- stormwater or lined ponds. This
18 is one of the lined. There's a lined stormwater runoff
19 for this whole facility that sits right here.

20 Q When was it lined?

21 A It was lined in about 2013, I believe.

22 Q When -- okay. That was just the stormwater collection
23 pond?

24 A Correct. So --

25 Q Not a manure storage pond well, although it collects

1 manure too, but it's not designed just for manure
2 storage; correct?

3 A Correct. It intercepts cement runoff from the field and
4 from the facility itself.

5 Q Okay. And what about those other impoundments? What are
6 they?

7 A Up above are multiple lagoon separators. The lagoons run
8 further up the -- they run off the map to the north. So
9 this would be, I believe, about half of the lagoons on
10 the DeRuyter facility. There's two here, one here, and
11 there's a large one here, and then another large lagoon
12 up above that. (Indicating.)

13 Q Okay. And the 85.6, is that from a monitoring well or
14 residential well?

15 A That is a residential drinking water well. We don't have
16 a monitoring well in that location.

17 Q All right. And in terms of residential wells, how does
18 that 85.6 rate in terms of contamination level compared
19 to the others?

20 A It is one of the highest residential well nitrate
21 concentrations we've detected at the site.

22 Q And that's upgradient from -- that squiggly snakey line
23 there, what's that?

24 A So --

25 Q Right below 85.6 and running just -- yeah, that.

1 A This is the Sunnyside irrigation canal.

2 Q Okay. And so the 85.6 is above -- or upgradient from the
3 canal. Would that be correct?

4 A It is just 200 feet above the canal.

5 Q Okay. What is the groundwater flow direction in that
6 area?

7 A Groundwater flows from northeast to southwest in this
8 area, up-flows from here down under the Sunnyside and
9 down into these residential areas. (Indicating.)

10 Q How do you know that?

11 A We do have multiple monitoring wells as part of a dairy
12 cluster in this area, so we have another monitoring well
13 over here, here, along this -- along the road here, and
14 then the cluster wells that we've shown before sit right
15 out in this area. (Indicating.)

16 So we have pretty good -- pretty good coverage of
17 this area as far as groundwater monitoring data.

18 Q Right. And from the monitoring well data that's put in
19 as part of the EPA AOC and the CARE consent decrees, can
20 you determine the groundwater flow direction?

21 A We can. So every time we monitor the monitoring wells,
22 we take water level elevation -- or water level
23 measurements, and then always wells are -- the well heads
24 are surveyed to a common elevation datum.

25 And then after we measure depth to groundwater, we

1 can subtract from the common data and get the elevation
2 of the water table all across the site.

3 Once we do that, we can put contours of equal head
4 across the site that represents the top of the
5 groundwater table, and then we know just like a topo map,
6 we can tell what's upgradient, what's downgradient, and
7 the direction that groundwater flows.

8 Q And so have you done those gradients for this area that's
9 depicted in Figure 1 in Exhibit A-2?

10 A Yes. We do them with every data set. So every quarter
11 we're looking at the groundwater contour maps and the
12 changes in the groundwater contour maps.

13 Q And did you provide a slide with the contours written in
14 overlaying the actual data from the monitoring wells as a
15 demonstrative for this board?

16 A I did.

17 Q And that hasn't been allowed in today, so I just wanted
18 to let -- to ask you if you've prepared that.

19 So based on that, have you made a determination of
20 the most likely source of the contamination at that
21 residential well at 85 .6 parts per million nitrate?

22 A We have. So what you have to realize is that a
23 monitoring well and a domestic water supply well are
24 different in multiple ways, but, in general, the
25 monitoring well is screened at the top of the water table

1 or at a specific interval.

2 And the water supply well is drilled deeper. I
3 believe this well is about 200 feet deep with a screen
4 down at 180 to 200.

5 So the screen is the intake where the water -- where
6 the water comes into the well, and wells that pump have
7 capture zones.

8 So as you -- as you pump water, the well sucks water
9 into the well and produces it for the resident, but an
10 area upgradient of the well is the capture zone.

11 So if we look at this specific location, the capture
12 zone depends a little bit on permeability as far as the
13 size, but we know the capture zone for the well would be
14 right back behind here, kind of in a U-shape area behind
15 the well. (Indicating.)

16 So based on that data, we know that the DeRuyter
17 lagoons and application fields and stormwater ponds are
18 all within the capture zone of that well, and over time
19 and the more you pump the well, the bigger that capture
20 zone gets.

21 Q Let me stop you there. Are there any other sources that
22 would cause, in your professional opinion, that 85.6
23 other than the DeRuyter dairy just to the north of that?

24 A Not in this case, no. That's the logical source of
25 nitrates.

1 Q I'm going to ask you a couple other questions.

2 Ms. Barney asked you about well costs, and there was
3 some discussion about the range, depending on how shallow
4 or the -- or how deep it is to the groundwater that costs
5 of the well range from maybe -- monitoring well range
6 from maybe four to ten thousand dollars a well --

7 A Correct.

8 Q -- in that general area of the Yakima Valley; correct?

9 A Yes.

10 Q And I just want to reiterate this, but in direct, we
11 talked about remediation costs versus prevention costs.

12 Remediation costs, I believe you said, were orders
13 of magnitude greater than prevention costs; correct?

14 A That is correct, yes.

15 Q Ms. Barney also asked you about evidence, of whether
16 there was any evidence of a past use of some of the areas
17 in the dairy like where the animal pens were in the
18 compost areas.

19 Do you remember that questioning?

20 A I do.

21 Q Those Cow Palace dairies have been operating for how
22 long? Forty years? Fifty years?

23 A To the best of my knowledge, 40 -- around 40 years.

24 Q And Bosma dairy?

25 A I think that's a little older than Cow Palace.

1 Q All right. Those are pretty historical uses, aren't
2 they?

3 A Yes, they are.

4 Q And the defendants never provided any evidence in the Cow
5 Palace case of prior uses of that property, did they?

6 A Not that I recall, no.

7 Q Just for scale, I want to just talk about the -- we were
8 talking about the Cow Palace -- the new lagoon that was
9 just done.

10 That was just completed in the fall of 2017;
11 correct?

12 A That's correct.

13 MS. HOWARD: Objection, Your Honor.
14 This is definitely outside the scope of our
15 cross-examination at this point.

16 MR. TEBBUTT: Ms. Barney asked about
17 it.

18 JUDGE FRANCKS: I'm going to allow it.

19 Q (By Mr. Tebbutt) So do you know approximately how many
20 gallons an Olympic-sized swimming pool holds?

21 A I believe it's about 600,000 -- a little over 600,000
22 gallons.

23 Q Right. And the new Cow Palace lagoon, just for sense of
24 scale, is set about 25 million gallons?

25 A Correct.

1 Q So 30 to 40 times the size of an Olympic-sized swimming
2 pool; correct?

3 A I'd have to pull out my calculator to make sure that's
4 accurate, but yes.

5 Q Well, 30 times 600,000 equals 18 million; right?

6 A Correct.

7 Q So more than -- more than that.

8 And that's only one of the lagoons at Cow Palace;
9 correct?

10 A Yes. That's one lagoon, No. 2.

11 Q Have you seen synthetic liners at dairies in other
12 states?

13 A I have.

14 Q What states?

15 A We're working on a similar dairy cluster in Wisconsin,
16 and there's -- I couldn't tell you exactly how many
17 lagoons are on the -- in the group, but the one dairy has
18 about five or six lagoons, and one of those is lined.

19 Q Synthetically lined?

20 A Correct.

21 Q Okay. There was also some discussion about -- you know,
22 Ms. Barney asked you questions about how you assessed,
23 you know, whether some lagoons were in good shape or not.

24 There was -- do you remember a particular event at
25 Cow Palace when monitoring wells were being installed

1 between some lagoons at Cow Palace that caused you some
2 significant concerns as a hydrogeologist?

3 A I do.

4 Q And tell the board about that, would you, please.

5 MS. BARNEY: Objection. This is
6 definitely beyond the scope.

7 MR. TEBBUTT: Not at all. Ms. Barney
8 asked him about integrity of the lagoons and such, and
9 this is directly --

10 JUDGE FRANCKS: Okay. I'll allow this
11 example, but I think we are straying far afield.

12 MR. TEBBUTT: This will do it.

13 A During drilling of one of the monitoring wells at Cow
14 Palace, it was -- it was the EPA doing the drilling.
15 They were drilling by one of the catch basins that had
16 recently been relined, according to NRCS standards.

17 And they were using a drill -- the drilling method
18 that we call air rotary drilling, so instead of using
19 liquid to lift the cuttings out of the hole, they used
20 air.

21 So as they drill down with their drill bit, they put
22 about 300 CFM of air down the hole.

23 Q (By Mr. Tebbutt) What's a CFM?

24 A Sorry. 300 cubic feet per minute of air at about 100 PSI
25 that lifts the cuttings up the hole, gets them out of the

1 way so you can continue to drill.

2 And when they were about a hundred feet deep, so
3 they were 70 or 80 feet below the bottom of the lagoon,
4 the lagoon started bubbling. So the air that they were
5 using to lift their cuttings in the hole, 100 feet away
6 from the lagoon was daylighting in the bottom of the
7 lagoon.

8 And what that -- what that really tells us is what
9 the integrity of this ten to the minus six liner really
10 is. If air is going to come up through it, then seepage
11 is definitely going to go down through it with nine or
12 ten or fifteen or twenty feet of head on it.

13 So it was really direct evidence that this -- this
14 liner that we've been talking about for two days is just
15 not sufficient to prevent groundwater contamination.

16 It also shows a direct conduit between the lagoon
17 and the subsurface 100 feet deep.

18 Q Along those lines, that lagoon was represented to you as
19 having been built to NRCS standards; correct?

20 A That is correct.

21 Q So that's built to one times ten to the minus six;
22 correct?

23 A Yes.

24 Q And then it was an operating lagoon, so it would be
25 assumed that that so-called manure seal added some

1 additional -- I'm trying to think of the right way to
2 phrase it -- some additional inhibition of permeability?

3 A That's correct.

4 Q And, nonetheless, it was bubbling up through?

5 A Yes.

6 Q Ms. Barney asked you about whether the Clean Water Act --
7 the -- the Cow Palace case was a RCRA case, Resource
8 Conservation Recovery Act; right?

9 A That's correct.

10 Q And the Clean Water Act deals with surface water
11 discharges. That's what -- the point she was trying to
12 make; correct?

13 A Yes.

14 Q And RCRA governs groundwater; correct?

15 A RCRA governs groundwater, but it's more focused on waste
16 disposal and waste characterization.

17 Q Right. But one of the things RCRA does, among its many
18 hundreds of pages of statutory information and thousands
19 of pages of regulatory implementation documents -- one of
20 the things it does is try to protect groundwater;
21 correct?

22 MS. HOWARD: Objection, Your Honor.

23 Calls for a legal conclusion.

24 JUDGE FRANCK: I'm going to allow his
25 understanding.

1 A That is correct. Groundwater monitoring is a large part
2 of RCRA as associated to waste and other releases.

3 Q (By Mr. Tebbutt) And under Washington law, groundwater
4 is considered waters of the state; right?

5 A That is correct.

6 Q So the bottom line is here, sir, regardless whether --
7 and Ms. Barney also asked you about -- well, yeah, the
8 maintenance of lagoons.

9 So Cow Palace had a nutrient management plan that
10 was approved by NRCS; correct?

11 A I believe it was written by and approved by NRCS, yes.

12 Q Right. And so they were required to maintain their
13 lagoons under that NMP; correct?

14 A Yes.

15 Q And in your opinion, did Cow Palace maintain their
16 lagoons in compliance with that NMP?

17 A I don't believe that they did. The lagoons did not look
18 like they should have if they were 100 percent completed
19 to the standard.

20 Q Right. And the erosional features that we talked about
21 yesterday, those would be examples of not maintaining
22 those lagoons to those standards; right?

23 A Correct.

24 Q So regardless of whether -- this is really the bottom
25 line: Regardless of whether these facilities bring their

1 lagoons back up to NRCS standards, isn't it your opinion
2 that they'll still be discharging pollution to
3 groundwater?

4 A It is.

5 MR. TEBBUTT: That's all I have.
6 Thank you.

7 JUDGE FRANCKS: Okay. So board
8 questions for Mr. Erickson?

9 Mr. Wise, you can go first.

10 EXAMINATION

11 BY MR. WISE:

12 Q Good morning, Mr. Erickson. I just had one area of
13 questions. If you had a lagoon -- manure lagoon with an
14 artificial liner and you went to clean that, what would
15 happen to that liner while you were cleaning it?

16 A So that's part of that engineering discussion on how you
17 manage these liners, but what we're doing now is
18 incorporating an agitator, fairly common piece of
19 equipment that the dairies use into the lagoon itself.

20 So we've got a floating agitator out there. They
21 use the lagoon for conveying water to the fields, and
22 then every year or every couple years, when they want to
23 clean it, they kick this agitator on.

24 And it stirs up that whole -- all of the solids that
25 are on the bottom, and then they're pumped off to be --

1 to go to compost or to be used in the field as an
2 application.

3 So the only protective measures you really have to
4 take is we call it -- we call it a rub sheet, but in the
5 areas where the ropes tether to that agitator, we add one
6 more sheet of that -- that geosynthetic liner so that the
7 rope doesn't rub through the liner over time.

8 Q So normally, if you use that method, you wouldn't damage
9 the liner when you were cleaning?

10 A Correct. It's -- that's designed for that. So a little
11 bit of that is based on the selection of your liner, so
12 you can't select too thin of a liner or the agitator
13 could damage it.

14 So for the most part, we've been using what we call
15 a 60 mil liner, which is about an eighth of an inch
16 thick, and the -- it can take the agitation pressures and
17 still be functional and not leak.

18 MR. WISE: Thank you.

19 THE WITNESS: You bet.

20 JUDGE FRANCKS: Ms. Brown.

21 EXAMINATION

22 BY MS. BROWN:

23 Q Yeah. So this is I think a very simplistic question, but
24 the lagoons, I understand, are designed to leak?

25 A That is correct.

1 Q So why were they designed that way in the first place?

2 A In my opinion -- and if you go back and look at the
3 accepted soil data for the liner like we've talked, it's
4 not really clay. It's a silt and a sand. It's a very
5 easy standard to obtain. You can usually do it with
6 on-site soils.

7 So I believe the decision was made, how do we give
8 some level of protection but we don't incur any real
9 expense?

10 So I truly believe that that was the decision that
11 was made.

12 Q So the protection that was anticipated was from going
13 through the soil slowly? Was that the idea?

14 A Yes. Yes. Slowing down the -- slowing down the leakage
15 rate.

16 Q Okay. So then all of these existing lagoons that are out
17 there that are designed to leak, is the only way that you
18 would know of to make them not leak anymore is to put in
19 some sort of synthetic liner?

20 A So you could -- let me give you just a little history.

21 About 1988, when I started in this industry, we put
22 in clay liners, and the construction of a true two-foot
23 clay liner is challenging at best.

24 In order to get the compaction and to get it sealed
25 like it should, you spend as much time in the field with

1 equipment and rollers and adding water.

2 You spend so much time in the field that it's
3 actually cost-prohibitive, and a lot of times you can't
4 meet the spec that you need.

5 So in my opinion, the -- the -- we shouldn't go as
6 far as the EPA is at Cow Palace where we have
7 double-lined leak detection, basically
8 hazardous-waste-type lagoons, but there are simple ways
9 of incorporating two feet of actual clay with a
10 geosynthetic on top that would give you a -- so much
11 higher level of protection than a ten to the minus six,
12 and literally get rid of this discussion, if you will.

13 That's about the best and the minimum liner that I
14 can see using at these locations.

15 Q Okay. There is -- there isn't anything you can add to
16 the manure lagoon, chemicals or whatever, that would seal
17 it or -- like you do when you're -- something on your car
18 leaks or --

19 A Radiator stop leak?

20 Q Yeah. Exactly.

21 MR. TEBBUTT: That only works for a
22 little while.

23 A There's -- there's -- there's nothing that we've found.

24 Q (By Ms. Brown) Okay.

25 A You would really have to dig up the soil and add like a

1 bentonite clay or something to it and then lay it back
2 down and compact it.

3 So you really have to get back into the bottom of
4 the lagoon. And by the time you take all those actions,
5 the liner becomes cheaper.

6 So some of the costs that we talked about with
7 Ms. Barney are for that Cadillac design, if you will. So
8 it could be done cheaper than the -- those examples.

9 MS. BROWN: Thank you.

10 EXAMINATION

11 BY MS. MARCHIORO:

12 Q So back to the last question about the sealant. Are you
13 familiar with earthen irrigation canals in Central
14 Washington?

15 A I am.

16 Q And don't they use at times a sealant that helps -- is
17 put into the canal before the irrigation season to create
18 a seal for that particular year?

19 A They do, and you're right. It's a kind of a bentonite
20 mixture that they spray on, and it works for one season,
21 and then they have to reapply the next season.

22 Q But there's a mechanism that's used to prevent leaking?

23 A There is.

24 Q Okay. And then in terms of -- I just wondering about the
25 lagoon leaking as -- you were talking about the only way

1 to determine was the groundwater monitoring, but could
2 you not do a mass balance?

3 A Yeah. And that -- that -- that idea has been beat to
4 death. All right. So what the mass balance involves is
5 monitoring the liquid level in the lagoon over the course
6 of a couple days.

7 At the same time, you have to have a -- some other
8 test equipment on-site to determine what the evaporation
9 rate is, and you have to balance that with basically the
10 type of day you have, how hot it is, is the wind blowing.
11 And you're really looking at changes in liquid level that
12 are a millimeter or less.

13 So we've done the mass balance a couple times. It
14 always seems like you come up with an answer that's like
15 might be leaking a little bit, might not be leaking a
16 little bit.

17 So it's not a -- it's not reliable, depending on
18 what's happening at the site and weather conditions.

19 Q And in your experience?

20 A In my experience and in review of quite a bit of data.

21 Q Okay. I was just wondering, in that photo there was a --
22 find it. If you -- just trying to understand what
23 this -- so if you can have somebody direct it over to the
24 left, it looks like a little housing development adjacent
25 to a facility.

1 Let me see. The monitoring well -- the monitoring
2 well to the north of it says 0.88. See where it is?
3 It's down in your bottom left corner. See that? If you
4 can move it up a little bit, please. Yep.

5 What is that facility? Do you know?

6 A So this right here? That's another dairy.

7 Q Okay. What's the name of that dairy?

8 A I don't recognize that dairy.

9 Q So it's not part of your cluster?

10 A No. So the graphs that I put up yesterday kind of ended
11 down here because, as we get into these other dairies, we
12 know that there's going to be additional impacts to
13 groundwater, and they require more monitoring to kind of
14 complete my -- the picture that I presented.

15 Q Okay. So you don't know what their operations are or
16 anything?

17 A I do not.

18 Q Okay. And so we're looking at -- is that in the same --
19 would the groundwater be moving in the same direction off
20 of that particular dairy northeast to southwest?

21 A Can you just back up like one click maybe?

22 Yes. So we have -- we have data right in this area,
23 so groundwater flow would be this way. (Indicating.)

24 MS. MARCHIORO: Okay. Thank you. And
25 then -- you shot down one -- my one scientific term, mass

1 balance, so I won't ask that again.

2 Okay. Great. Thank you.

3 JUDGE FRANCKS: Questions based on the
4 board questions?

5 MR. TEBBUTT: Couple.

6 FURTHER EXAMINATION

7 BY MR. TEBBUTT:

8 Q With regard to the mass balance, whether you do a mass
9 balance or not, you still can't tell the background
10 conditions of the groundwater unless you have groundwater
11 monitoring; correct?

12 A That is true, yes.

13 Q So you don't know what the impacts are from the lagoon
14 without the background conditions too; correct?

15 A Correct.

16 Q You need upgradient tests to determine that; correct?

17 A Yes.

18 Q Okay. And Board Member Marchioro asked you about, like,
19 a community or something, maybe community wells, if
20 they -- you're familiar with the safe drinking water
21 action regulations for community wells?

22 A Not directly, no.

23 Q Okay. But if there's a community water supply, they're
24 required to have more monitoring of their wells; right?

25 A Correct. If they supply more than 25 people, then they

1 have to do monthly monitoring.

2 Q Right. And so the wells that are around the dairy that
3 you and Ms. Marchioro talked about, you don't know
4 specifically how deep those are; right?

5 A No, I do not.

6 Q And none of those are monitoring wells installed to
7 determine whether that particular dairy is causing or
8 contributing to groundwater quality violations; correct?

9 A Correct. Those are private drinking water supply wells.

10 Q Okay. And then Ms. Brown asked you about NRCS and some
11 of the standards.

12 NRCS is a division of the United States Department
13 of Agriculture; correct?

14 A Yes.

15 Q Not EPA; right?

16 A Correct.

17 Q So their mission isn't to protect the environment;
18 correct?

19 MS. HOWARD: Objection, Your Honor.
20 So for one thing, this isn't at issue here, what the
21 different missions are, but also just -- I do think we're
22 going a little beyond the board questions at this point.

23 JUDGE FRANCKS: Yeah. That's beyond
24 what --

25 MR. TEBBUTT: That's not a problem.

1 Q (By Mr. Tebbutt) Last question, sir. Mr. Wise asked you
2 about artificial liners and how you clean them. Were
3 there other things that you did in your design to allow
4 equipment to get in and out of the lagoons?

5 A So there's basically three types of lagoons at most of
6 these dairies. The first one in line are settling
7 basins, so they receive the majority of the solids, and
8 they act as decane basins.

9 So the raw liquids come into these basins. It
10 settles out the solids, decanes off the liquid, flows
11 into the next basin through a series of pipes.

12 So the most upgradient basins receive the most
13 solids and require to be cleaned the most often. So we
14 treat the lagoons -- the lagoons further down the flow
15 path different than the first ones.

16 The ones through the middle of the flow path receive
17 very little solids, so they require very little cleaning.
18 The first ones, you either have to get in there with a
19 tractor to clean them or you have to aggressively agitate
20 them.

21 So what we've done on the design for the settling
22 basins is, we've incorporated a concrete ramp into the
23 bottom, and then the liner manufacturers make a product
24 that you cast into the concrete, and then you can weld
25 that liner right to the concrete.

1 So you can access the lagoon that has the highest
2 solid content with a tractor or a piece of equipment to
3 clean it on a concrete pad.

4 Q Right. And so the leak detection system that's built
5 into the system between the liners, what's that --
6 what -- doesn't that provide you with information as to
7 whether the top liner has been reached?

8 A Correct. So the reason the EPA incorporated the leak
9 detection, which is just -- looks kind of like a
10 geosynthetic web, if you will, but it provides
11 permeability in case the top liner leaks and liquid
12 enters between the top liner and the secondary liner that
13 runs into the sump and you can detect it.

14 So that tells you if you have a leak in your primary
15 liner, and you can repair that before you ever leak
16 through your secondary liner.

17 Q Right. And that leak detection system can actually kind
18 of pinpoint where the problem is; right?

19 A Correct. Yes.

20 Q And so without that, wouldn't you have to go in and empty
21 the whole lagoon if the monitoring wells were there alone
22 without leak detection?

23 MS. BARNEY: Your Honor, I'm going to
24 object at this point. Seems like we've gone way beyond
25 cleaning the facility of this --

1 JUDGE FRANCKS: And I'm going to
2 sustain that. Gone beyond the question.

3 MR. TEBBUTT: Just trying to create
4 the record so you understand everything. That's what
5 we're here for.

6 JUDGE FRANCKS: So you're done with
7 your questions?

8 MR. TEBBUTT: Yes. Thank you.

9 JUDGE FRANCKS: Anyone else have
10 follow-up?

11 MS. BARNEY: Ecology does.

12 JUDGE FRANCKS: Ms. Barney.

13 FURTHER EXAMINATION

14 BY MS. BARNEY:

15 Q Mr. Erickson, I'm interested in the question that Board
16 Member Marchioro asked you about the mass balance work.

17 Am I correct in remembering that the NRCS standard
18 assumption is approximately 5,000 gallons of leakage per
19 acre per day?

20 A I think it's a thousand.

21 Q But its initial --

22 A Oh, so ten to the minus six at 5,000? That would be
23 pretty close, yes.

24 Q So between 1,000 and 5,000 gallons per day?

25 A Correct.

1 Q So this is -- is this like taking a 1,000-to-5,000-gallon
2 bucket and dumping it directly into groundwater?

3 A No, it is not.

4 Q Because what I heard you say was that over a couple of
5 days, doing the mass balance equation, you were only
6 talking about changing the level in the -- for
7 measurement purposes, changing the level in the lagoon by
8 millimeters; correct?

9 MR. TEBBUTT: Objection.

10 Mischaracterizes testimony. This wasn't mass balance.
11 This was the hydrous model, which is a different thing.

12 A No. No. This was --

13 MR. TEBBUTT: I apologize. I
14 withdraw.

15 Q (By Ms. Barney) So -- and that change in levels of
16 millimeter in an impoundment or around an acre or even
17 larger, the problem with using that mass balance approach
18 is that it's barely even detectable?

19 A The problem is, it's -- I'm going to say this and
20 probably have to explain it. It's within the noise of
21 the data that you collect.

22 So you have multiple things going on while you're
23 doing this test. You have an evaporation, and you have
24 variable rates of evaporation, and then, in theory, you
25 have seepage.

1 So it's hard to tell what is contributing the most
2 to that loss of water, and the biggest problem is that we
3 take a -- we take a clean -- pan of clean water and put
4 it on the side of the lagoon, and we monitor the
5 evaporation in that pan and we say, "Okay. That
6 correlates with the evaporation in the lagoon."

7 But you've got two completely different liquids that
8 you're looking at. One, you've got clear water, and the
9 other one, you've got this black liquid with high
10 organics.

11 So if your evaporation doesn't correlate, then it's
12 really tough to tease out of the data, if you will,
13 what's seepage and what's evaporation.

14 So we -- early on in the Cow Palace litigation, we
15 tried to do a few of these mass balance, and at the end
16 of the day, the EPA finally just threw it out and said,
17 "We're not going to accept that data because there's too
18 much room to argue about where your loss is."

19 Q So -- but your loss overall is still only in millimeters?

20 A Correct. So if you're losing a thousand gallons a day in
21 a four-acre 25-million-gallon lagoon, then it's a very
22 small percentage of your total volume.

23 Q So that -- again, that's a different scenario than your
24 earlier figure that you and I discussed where you modeled
25 the breach where you actually do have -- would that be

1 something that you could visibly determine?

2 Would that be lower the level of lagoon larger than
3 just a few millimeters potentially?

4 That's okay. I know you didn't model that. I don't
5 want to necessarily hold you to an answer, if you're not
6 comfortable.

7 A Thank you. I'm calculating here, but I'm struggling a
8 little bit.

9 MS. BARNEY: Fair enough. Thank you
10 very much. That's all I have.

11 JUDGE FRANCKS: Is that -- Ms. Howard?

12 MS. HOWARD: Thank you. Thank you.

13 FURTHER EXAMINATION

14 BY MS. HOWARD:

15 Q So the questions about bentonite and sealing, isn't that,
16 in fact, the concept that's used under either the NRCS
17 standard or any other standard where you actually would
18 do an additive into the liner in order to reduce the
19 permeability or the seepage of the liner?

20 A Yes. It is used. It is a method.

21 Q And, in fact, in the NRCS standard, it's required that
22 you do those additives in order to meet the requirements
23 to ensure you have a properly designed lagoon? Is that
24 consistent with sort of the sealing idea?

25 MR. TEBBUTT: Objection. Lack of

1 foundation. No discussion of what standard she's
2 referring to.

3 MS. HOWARD: I think the witness has
4 indicated that he understands the NRCS standards.

5 A So, yes, the -- you know, adding additional clay or silt
6 to the mixture is a way to reduce the permeability of the
7 liner.

8 Q (By Ms. Howard) Okay.

9 A That -- is that what --

10 Q Yeah. Yeah. Exactly.

11 The agitator that we were talking about too, you
12 said that that's fairly common on dairy farms?

13 A It is.

14 Q And is that also -- that method also used on
15 earthen-lined lagoons?

16 A Yes.

17 Q And if that method is used on earthen-lined lagoons, then
18 you would also not need to do sort of the cleaning of the
19 earthen-lined lagoons of the solids there as well;
20 correct?

21 A Correct. But I would be concerned, again, with that --
22 with just the energy that's put into that liquid actually
23 eroding the liner at the bottom.

24 Q Have you seen that happen?

25 A I have not.

1 MS. HOWARD: Okay. No further
2 questions.

3 JUDGE FRANCKS: Okay.

4 MR. TEBBUTT: May I ask one follow-up?

5 JUDGE FRANCKS: Based on what?

6 MR. TEBBUTT: Based on what Ms. Howard
7 just asked about retarding leakage, about adding stuff to
8 the liners to stop the leakage. Just one question.

9 JUDGE FRANCKS: One question.

10 FURTHER EXAMINATION

11 BY MR. TEBBUTT:

12 Q So Ms. Marchioro also asked you about this, adding some
13 kind of spray sealant to the canals.

14 That doesn't stop leakage, just retards leakage a
15 little bit more; correct?

16 A Correct. It just reduces the permeability of that -- of
17 that -- of the area where it's applied.

18 MR. TEBBUTT: Okay. Thank you.

19 JUDGE FRANCKS: Okay. Mr. Erickson,
20 you are excused.

21 THE WITNESS: Thank you.

22 JUDGE FRANCKS: Thank you very much.

23 So we're going to take a ten-minute break.

24 Are we calling Ms. Reddout next?

25 MR. TEBBUTT: We are.

1 JUDGE FRANCKS: Okay. So get the
2 phone ready to go.

3 MR. TEBBUTT: We shall.

4 JUDGE FRANCKS: If you need Lynn's
5 help, let her know.

6 MR. TEBBUTT: Thank you.

7 JUDGE FRANCKS: We're off the record.

8 (Recess taken from 10:30 a.m.
9 to 10:44 a.m.)

10 JUDGE FRANCKS: Okay. Have a seat.
11 Let's go back on the record.

12 Mr. Tebbutt, you have a new witness for us?

13 MR. TEBBUTT: We do have a new
14 witness, but it's not me, Your Honor.

15 Mrs. Reddout, can you hear us?

16 MS. REDDOUT: Yes, I can.

17 MR. TEBBUTT: All right. Will the
18 court reporter please swear you in.

19

20 HELEN REDDOUT, having been first duly sworn
21 by the Certified Court
22 Reporter, testified as follows:

23

24 ////

25 ////

1 DIRECT EXAMINATION

2 BY MR. TEBBUTT:

3 Q Good morning, Mrs. Reddout. Thank you for appearing by
4 telephone and glad you're feeling a little better.

5 A I am. Thank you for asking.

6 Q Just for background and because you're not here, can you
7 just tell the board a little bit about your background,
8 you know, just quickly where you grew up and where you
9 live now and how long you've lived there.

10 A Okay. Raised in Southern California from my junior
11 year -- or junior high year. We moved back to Missouri
12 where my dad bought a dairy. That was an experience.

13 And then in -- when I graduated in '54, I came out
14 here to work and met my husband, and we were married in
15 '54 and bought orchards shortly after that.

16 And I've been farming here for 64 years now.

17 Q When you say "here," where is that? What's the town, the
18 community you live in?

19 A The closest one is Granger, Washington. It's in the
20 Lower Yakima Valley.

21 Q Is that also known kind of as the Outlook and Zillah
22 area?

23 A Yes.

24 Q Okay. And I assume you have children?

25 A I do. I have -- I have five children, one who is

1 deceased, so I now have four living children. I have
2 eleven grandchildren and I have great-grandchildren, ten.

3 Q You said you had orchards. What kind of orchards?

4 A Cherry orchards, for the most part. We probably have
5 about 5 percent diversified apples and Italian prunes.

6 Q And how many decades have you been doing cherry farming?

7 A Sixty-four years.

8 Q Sixty-four years. All right.

9 A Yeah.

10 Q And are you -- what's your role for CARE? What is your
11 title?

12 A I am the president of CARE organization.

13 Q And are you one of the founding members of CARE?

14 A I am.

15 Q And when was CARE founded, approximately?

16 A In '97.

17 Q Okay. And was CARE the lead or actually the only
18 litigant in a number of Clean Water Act enforcement cases
19 against big dairies in the Lower Yakima Valley in the
20 late '90s?

21 A Yes, we were.

22 Q And did that include cases against the Bosma and Liberty
23 dairies?

24 A Yes, it was.

25 Q And the George DeRuyter & Sons Dairy?

1 A Yes.

2 Q And a number of other dairies as well?

3 A Yes.

4 Q And were -- the Bosma case actually went to trial in
5 front of Judge Shea in the federal district of Eastern
6 Oregon, didn't it?

7 A Yes. Down in Richland, mm-hm.

8 Q And that was appealed to the Ninth Circuit Court of
9 Appeals; correct?

10 A Correct.

11 Q And a number of the cases eventually settled, didn't
12 they?

13 A Yes, they did. Once they saw how -- what overwhelming
14 proof we had of what we were saying, then they decided
15 they'd come to the table and negotiate, which was what we
16 wanted to start with.

17 Q And, ma'am, are you familiar with the term "consent
18 decree" after all these years?

19 A Yes, I am.

20 Q And did CARE enter into consent decrees with a number of
21 the dairies?

22 A Yes, we have.

23 MS. HOWARD: I'm just going to object
24 on the grounds of relevance to this line of questioning.
25 How it -- again, how it relates to the issues before the

1 board is very unclear.

2 JUDGE FRANCKS: Okay. And I --

3 THE WITNESS: I didn't hear that.

4 JUDGE FRANCKS: Ms. Reddout, there's
5 an objection from the dairy lawyers, and so -- this is
6 Heather Francks. I'm the administrative appeals judge
7 who's presiding in this case.

8 So I am going to decide -- if people object to some
9 of the questions that your lawyer is asking you, I'm
10 going to decide whether you can answer those questions or
11 not.

12 THE WITNESS: Okay.

13 JUDGE FRANCKS: So if you hear -- I'm
14 not sure how much you can hear, but if you hear
15 talking --

16 THE WITNESS: I can hear your voice.
17 Such a distance, I couldn't hear what she was saying. I
18 could hear her voice.

19 JUDGE FRANCKS: I think if you hear
20 anything other than a question to you, maybe hold and
21 wait for us to tell you what's going to happen.

22 THE WITNESS: I can do that.

23 JUDGE FRANCKS: Okay. Great. Thank
24 you so much.

25 So -- okay. So I am going to allow a few more

1 questions in this area, but I think we are on the edge of
2 relevance to the issues in this case.

3 MR. TEBBUTT: Yeah. I understand,
4 Your Honor. This is just kind of background, just
5 setting the historical record.

6 Q (By Mr. Tebbutt) So the -- the settlements with some of
7 the dairies, did they include a provision about studying
8 groundwater contamination in the Lower Yakima Valley?

9 A Yes. When we won the first case with Bosma, we took all
10 of the money that came from that case and we gave it to
11 two institutions, Heritage College and the Valley
12 Institute for Research and Education.

13 And they ran water studies on low income residents
14 here in the valley.

15 Q And do you recall what the general findings were in terms
16 of the percentage of pollution of residential wells of
17 low income residents for those two studies?

18 A Yes. 20 percent of the wells that were tested were
19 tested at 10 parts per million or higher; and some of
20 them, much higher.

21 Q And was that in a time period of about 2002 and 2003?

22 A I believe that's correct.

23 Q And, ma'am, in 2006, was CARE the chief appellant
24 challenging the Department of Ecology's 2006 CAFO permit?

25 A Yes, we were.

1 Q And in that challenge, did CARE request groundwater and
2 surface water monitoring, among other things?

3 A Yes, we did.

4 Q Okay. Soon after -- sometime after that, around 2008, is
5 there a report that came out or a report by a newspaper
6 about the contamination in the Lower Yakima Valley?

7 MS. HOWARD: Objection. Again, Your
8 Honor --

9 MR. TEBBUTT: Hang on just a second,
10 Helen. We have an objection.

11 MS. HOWARD: Again, a relevance
12 objection. Newspaper article from 2008, that I just,
13 again, don't see how this is relevant to the issues
14 before the board.

15 MR. TEBBUTT: For foundational
16 purposes, and it's very important for just -- it's just
17 this question that leads into the next, if you'll allow
18 it.

19 JUDGE FRANCKS: I'm going to sustain
20 that objection. I think a newspaper report is beyond the
21 scope of the issues in this case about the permit.

22 MR. TEBBUTT: All right. Just note an
23 exception for the record.

24 Q (By Mr. Tebbutt) In the late 2008-2009 era, were you
25 contacted by EPA about the --

1 A Yes.

2 Q -- contamination in the Lower Yakima Valley?

3 A Yes, we were.

4 Q Describe that, please, for the board.

5 MS. HOWARD: Your Honor, I'm going to
6 object again. I just -- I'm really concerned here that
7 we are going well, well beyond the scope of what the
8 permit terms are and whether they comply with the
9 statutes that are at issue here.

10 This is not relevant to the case, and it's -- and
11 this is -- this line of questioning is being done in
12 order to establish a negative view of the dairy industry.

13 And, again, that is highly prejudicial, and so,
14 again, relevance ground objection and also just grounds
15 of this line of questioning is intended to establish
16 prejudice and really is improper in this proceeding.

17 JUDGE FRANCKS: I am going to allow a
18 little more, but we need to bring it up to the present
19 pretty quick.

20 MR. TEBBUTT: That's what we're doing.
21 We've got to go through the timeline to get there.

22 Q (By Mr. Tebbutt) So the EPA study that -- well, tell us
23 a little more. Please answer the question.

24 What were your discussions with EPA about?

25 A Well, after -- after the newspaper article came out, EPA

1 contacted us, and we talked with them for several -- oh,
2 several meetings, and finally they decided that the
3 situation was bad enough over here that they needed to
4 run a study.

5 And I believe the study ran for, oh, two, three
6 years. It was a long time. It was a very thorough study
7 where they had taken the samples that they took here at
8 the valley, and not only took them to their lab but to
9 several other labs throughout the United States.

10 MS. HOWARD: Your Honor --

11 MR. TEBBUTT: Let me stop you there,
12 if I may.

13 MS. HOWARD: And pardon. Just two
14 objections. Actually, one, we're definitely getting, I
15 think, even beyond the hearsay that's allowed under this
16 board's rules and that discussion.

17 And then also we specifically addressed already
18 whether this expert could provide -- or whether this
19 witness could provide expert testimony to try to talk
20 about an EPA study, what it means, and how to interpret
21 it I think is well into the realm of expert witness
22 testimony.

23 JUDGE FRANCKS: I'm going to sustain
24 that objection because what Ms. Reddout can testify about
25 is her own personal knowledge.

1 MR. TEBBUTT: Right. And that's all
2 I'm asking her.

3 JUDGE FRANCKS: Well, I think we were
4 going into too much detail about what the study entailed
5 and what -- how they did it.

6 MR. TEBBUTT: Okay. I didn't ask her
7 that. She was just discussing that. Witness's tend to
8 talk and give answers that they want to. I can't control
9 that.

10 THE WITNESS: I'm sorry.

11 Q (By Mr. Tebbutt) That's okay, Helen. That's all right.
12 You're doing fine.

13 So did you assist EPA in helping to get residential
14 wells to test for that study?

15 A No. Because we were supposed to stay out of it and stay
16 neutral.

17 Q Okay. Thank you.

18 Then was CARE a litigant in the -- what we've been
19 referring to in this hearing as the cluster litigation,
20 the cases against Cow Palace, Bosma dairy, and DeRuyter &
21 Sons, and DNA dairy?

22 A Yes. Definitely we were.

23 Q And did CARE enter consent decrees in those cases with
24 those defendants?

25 A Yes, we did.

1 Q And was one of the components of the consent decree
2 setting up a clean drinking water project for -- to test
3 and provide alternative water to people whose homes have
4 been contaminated with --

5 A That's correct.

6 Q -- nitrates?

7 And did you assist in the development and
8 implementation of that drinking water project?

9 A Yes, I did.

10 Q And was --

11 A CARE did.

12 Q -- Nuestra Casa the entity that CARE hired to visit homes
13 to do outreach in the community to get wells tested and
14 to help provide alternative water?

15 A That's correct.

16 Q Okay. Can you describe in terms -- well, let me ask you
17 this: How many large dairy CAFOs are in the area where
18 you live?

19 A Well, it varies so much. We usually say 60 to 80.

20 Q Okay.

21 A Even -- well, 60 to 80.

22 Q And just describe, in general terms, what those dairies'
23 impacts have been to your life in the Yakima Valley.

24 A Well, from my point of view, they have taken a beautiful
25 agricultural valley where we can smell the flowers and

1 being harvested and we can smell good clean air, and
2 they've turned into a toxic waste dump where the air is
3 polluted and the water is polluted, and it's unsafe for
4 human habitation truthfully.

5 Q Thank you, Ms. Reddout. Just a couple other things.

6 Is it your understanding or do you believe that
7 everyone in the Yakima Valley knows whether their water
8 is contaminated or not for those people who rely on
9 drinking water?

10 MS. HOWARD: Objection, Your Honor.
11 Calls for speculation.

12 MR. TEBBUTT: Stop for just a second,
13 Helen. We have an objection.

14 MS. HOWARD: Calls for speculation.
15 We have not laid the foundation for this question.

16 JUDGE FRANCK: I'm going to sustain
17 that objection.

18 Q (By Mr. Tebbutt) Mrs. Reddout, have you talked to lots
19 of people in the community about the concerns of
20 groundwater contamination and drinking contaminated
21 groundwater?

22 A Yes, I have.

23 Q And do you believe all of those people can afford to pay
24 for alternative drinking water themselves?

25 MS. HOWARD: Objection. Your Honor,

1 again, we've not laid the foundation for this question,
2 and this is borderline expert witness testimony as well.

3 MR. TEBBUTT: It's not at all.

4 JUDGE FRANCKS: I'm going to sustain
5 that. That's her opinion about whether they can afford
6 the cost.

7 Q (By Mr. Tebbutt) Do you know lots of people in the area
8 and what their income levels are, Mrs. Reddout?

9 A Well, I know, when I worked at the school as a teacher
10 back in the '70s, that 85 percent of the children
11 attending school there qualified for free lunch.

12 So we're dealing with an income that is very --
13 very -- what do I want to say? -- limited.

14 Q Okay. And you taught -- was that at the Outlook -- what
15 level did you teach?

16 A I taught junior high at the Granger High School.

17 Q Okay. And have you spoken with people in the community
18 about the dangers of drinking contaminated nitrate water?

19 A Yes. And it's very difficult to get the point over
20 because it's something you can't see, and it's something
21 you can't taste.

22 And so if it's a matter of taking care of this
23 problem or buying shoes for the children or food for the
24 table, they neglect the drinking water.

25 Q Okay. And do you have -- is your well contaminated above

1 ten parts per million?

2 A Yes, it is.

3 Q Do you have a reverse osmosis system on your faucet at
4 your house?

5 A Yes, I do. That takes care of the kitchen sink only.

6 Q Okay. And describe for us what reverse osmosis system
7 is, how it works and how easy it is to use.

8 A Well, it's a tank. Looks kind of like a propane tank.
9 It sits underneath your sink, and it has filters and
10 diaphragms in it that processes the water.

11 And so the contaminated nitrate contaminated water
12 comes in, runs through that system, and then it comes out
13 of your faucet clean -- supposedly clean.

14 Q Does the water come out as quickly through that filter as
15 it does from a kitchen sink without the reverse osmosis
16 system?

17 A No. And it's rather aggravating to go through your sink
18 and have a special faucet where you can get clean water
19 from your own well.

20 Q And does the reverse osmosis system require maintenance?

21 A Yes, it does.

22 Q How often?

23 A Well, that depends on how polluted the water is. With
24 me, it's once or twice a year. For some people, it's
25 two -- every two months or three months. It depends

1 because that diaphragm will fill up with particles and
2 then at that point it's not of value.

3 Q So it's not an easy process, not as easy as just turning
4 on your tap for the groundwater?

5 A No, definitely isn't. And it -- I don't think --
6 personally I don't think it tastes as good either. It's
7 processed water as opposed to the old water that we used
8 to have where we could just turn the faucet on --

9 Q All right.

10 A -- and drink.

11 Q Helen, have I represented you for the entire span of the
12 CARE litigation in the Yakima Valley?

13 A Yes, you have.

14 MR. TEBBUTT: All right. Thank you.
15 That's all the questions I have.

16 You'll get some questions perhaps from Department of
17 Ecology's lawyer, Ms. Barney, or, I think, Ms. Howard for
18 the industry, and you may get some questions from the
19 board as well. So hang on.

20 THE WITNESS: Okay.

21 JUDGE FRANCKS: Ms. Barney?

22 MS. BARNEY: Ecology has no questions.

23 JUDGE FRANCKS: Okay. Ms. Howard?

24 MS. HOWARD: No questions.

25 JUDGE FRANCKS: Okay. Board members?

1 MR. WISE: Nothing.

2 JUDGE FRANCKS: Okay. No redirect?
3 Okay. Ms. Reddout, thank you very much for your
4 testimony. You're excused.

5 MR. TEBBUTT: Thank you very much,
6 Helen. You may hang up now.

7 THE WITNESS: Thank you. Bye-bye.

8 MR. TEBBUTT: And with that, reserving
9 any potential rebuttal witnesses, the plaintiffs have put
10 in their case in chief.

11 JUDGE FRANCKS: Excellent. All right.

12 MR. TEBBUTT: I should say for the
13 record, most of their case in chief. Some has been
14 disallowed.

15 JUDGE FRANCKS: So, Ms. Howard --

16 MS. HOWARD: Yes.

17 JUDGE FRANCKS: -- do we have a
18 witness?

19 MS. HOWARD: We do, Your Honor. I
20 am -- before we call our live witnesses, I just want to
21 touch briefly on Mr. Reck's testimony.

22 JUDGE FRANCKS: We'll move that later.

23 MS. HOWARD: So obviously one of our
24 witnesses was Mr. Reck. We've already talked about this
25 a lot.

1 I am not going to read his deposition into the
2 record, but I did want to point out just a few key areas,
3 and obviously we're hopeful that the board will have some
4 time to review this deposition transcript, as it does lay
5 groundwork and foundation and information for some of our
6 other witnesses as we proceed.

7 But I just wanted to take a few moments and point
8 out some key components of that transcript for review
9 before we proceed on with our other witnesses.

10 JUDGE FRANCKS: Okay.

11 MS. HOWARD: And, again, in lieu of
12 reading this in, a little bit of this, we did cover in --

13 MR. TEBBUTT: Your Honor, if I may,
14 I'd like to object, again, for the record that we believe
15 this is completely outside the discovery deadlines.

16 This was not done with proper notice. It violates
17 the CR rules for adequate notice. It was done with only
18 three days' notice, not five days, and it's been made
19 irrelevant by the testimony here in this hearing.

20 JUDGE FRANCKS: Okay. And all of that
21 was ruled on already.

22 MR. TEBBUTT: Understood.

23 JUDGE FRANCKS: Okay. Go ahead,
24 Ms. Howard.

25 MS. HOWARD: Thank you. So just

1 starting at the beginning, Mr. Reck lays out his
2 professional background and position with NRCS, starting
3 at Page 11, Line 24, through Page 14, Line 18, and then
4 also touches on it again on Page 15, Line 2, through
5 Page 17.

6 He then talks about the Standard 313, which, again,
7 is the standard from NRCS for the national standard for
8 animal waste storage lagoons, the basis for that
9 standard, the research and experience and information
10 that goes into that standard, starting on Page 18,
11 Line 21, through 19, Line 10, and then again on Page 21,
12 Line 11, through 23, Line 6.

13 Within the context of that discussion, he talks
14 about how that standard has been in place for 30 years --
15 that's on Page 13, Line 10 -- and then also talks about
16 the fact that there's no other analogous standard in the
17 United States. That's on Page 24, Line 16 through 22,
18 and then on Page 26, Line 14 through -- excuse me --
19 Line 4 through 18.

20 He talks about NRCS liner construction and its
21 purpose and how it's protective of groundwater, and
22 particularly references the drinking water standard, the
23 10 milligrams per liter. Goes into some detail on that,
24 starting on Page 32, Line 11, and that goes through
25 Page 37, Line 7.

1 And then there's some further discussion about that
2 on Page 41, Line 11, through Page 46, Line 4.

3 He talks about manure sealing as well a little bit
4 further back in the deposition transcript. That's
5 Page 52, Line 9, through Page 54, Line 11. And he talks
6 about some of the different topics on that, that we've
7 discussed this week.

8 Then there's discussion about the different types of
9 liners that are -- that meet the NRCS standards, clay
10 liners as well as other types of liners that meet the
11 NRCS standards, and goes through that in some detail,
12 beginning on Page 54, Line 19, through Page 59, Line 9.

13 And he discusses specifically groundwater protection
14 from the liners and from the lagoons on Page 35, Lines 19
15 through 23, Page 36, Line 2 through 10, and then Page 83,
16 Lines 10 through 19.

17 And within that discussion also is a discussion
18 about seepage, which we've had a number of questions and
19 discussion on, and that is on Page 37, Line 8, to
20 Page 41, Line 1.

21 And then finally the two-foot vertical separation
22 issue is referenced in two different places as well, and
23 that is on Line -- excuse me -- on Page 61, Line 19,
24 through 69, Line 21. Then Page 73, Lines 5 through 11,
25 and Page 87, Lines 16 through Page 90, Line 4.

1 All of these are within the designated portions of
2 the transcript, and that did not cover all of the
3 designated portions of the transcript, but I did want to
4 highlight those in particular as they relate directly to
5 the issues that we've been talking about the last few
6 days and are definitely an important part of our case in
7 this matter.

8 And I'm now --

9 MR. SNYDER: Your Honor, if I could
10 beg the board's indulgence one more time on this matter,
11 I --

12 JUDGE FRANCKS: Well, Ms. Howard
13 wasn't finished, so when she's finished, sure.

14 MS. HOWARD: I was actually going to
15 go ahead and turn it over to Ms. Nicholson to call our
16 first live witness.

17 JUDGE FRANCKS: Okay. So go ahead.

18 MR. SNYDER: Thank you, Your Honor.
19 My clients have been deprived the opportunity to cross
20 Mr. Reck on any of these topics, and as we've stated
21 numerous times, part of the reason of that is our
22 contention this is unreasonable.

23 But we believe the ability to cross Mr. Reck,
24 especially in the context of this hearing, is a
25 constitutional component of due process, especially the

1 right to a fair hearing here.

2 So I just want to make sure that objection is also
3 lodged on the record because that's something we're going
4 to be pursuing on the record.

5 JUDGE FRANCKS: Okay. That is on the
6 record.

7 Ms. Barney, do you have any comment or anything that
8 you need to cover with this deposition?

9 MS. BARNEY: Thank you, Your Honor.
10 No. Ecology doesn't have anything outside of the
11 designations that are made in this document, although
12 some -- as Ms. Howard said, some of them are not
13 necessarily all cited in what she just provided.

14 But my understanding is that everything designated
15 in the transcript itself is before the board as an
16 exhibit.

17 JUDGE FRANCKS: Yes.

18 MS. BARNEY: Thank you.

19 JUDGE FRANCKS: Okay. So,
20 Ms. Nicholson?

21 MS. NICHOLSON: We call Dr. Kevin
22 Lindsey.

23 MR. TEBBUTT: If I may, just as a
24 housekeeping matter, we weren't informed until this
25 morning in the change of witnesses.

1 JUDGE FRANCKS: And what is the change
2 in witnesses because I don't know either?

3 MR. TEBBUTT: It was going to be
4 Harrison, Haggith, Lindsey, and now it's switched up this
5 morning, so we would appreciate notice from counsel about
6 these changes. But we'll still proceed.

7 MS. NICHOLSON: And if you'd like me
8 to address that, Your Honor, we're trying very hard to
9 get in two witnesses today, and so that's why we switched
10 up our order. We thought that we could, perhaps, with
11 the witnesses that we chose.

12 JUDGE FRANCKS: That's fine. Thank
13 you.

14 You may sit and the court reporter will swear you
15 in.

16
17 KEVIN LINDSEY, PH.D., having been first duly sworn
18 by the Certified Court
19 Reporter, testified as
20 follows:

21
22 JUDGE FRANCKS: Mr. Lindsey, if you
23 wouldn't mind, you can move this phone into the chair in
24 front of you. I know it's a little bit weird, but --
25 please proceed.

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DIRECT EXAMINATION

BY MS. NICHOLSON:

Q Good morning, Dr. Lindsey.

A Good morning.

Q Could you please pull out our binders.

A Which are?

Q They should say -- not the green ones. The really big one. Right in front of you.

A This one or this one?

Q I'm pretty nearsighted, so I can't read them. The other one. Thank you.

And I'd like you to look at Exhibit I-7, please.

A Okay.

Q And what is Exhibit I-7?

A That's my resume from EA Engineering.

Q And can you give us a little bit of your work experience, please.

A Sure. I'm a licensed hydrogeologist in the state of Washington. I've worked in this state for 25 or more years, predominantly water resource management, but also some environmental work, some water rights work. Basically water work in Washington and Oregon.

Q And previous to Geoengineers?

A Oh, resume is my EA -- the resume is my resume from my former employer as of three weeks ago, EA Engineering.

1 Three weeks ago I moved over to Geoengineers.

2 Q And so you did similar types of jobs for both --

3 A Yes.

4 Q -- EA Engineering and Geoengineering?

5 A That is correct.

6 Q And -- okay. And can you give us a little bit of your
7 educational background.

8 A My educational background, I have a master's and
9 bachelor's of science in geology from University of
10 Missouri Columbia, 1979; master's of science and geology,
11 Idaho State University, 1992; and a Ph.D. in geology from
12 WSU, 1987.

13 Following that, I continued my education through
14 some postdoctoral work at the Hanford site where I
15 started doing a lot of groundwater hydrogeology work as
16 part of the Hanford project.

17 MS. NICHOLSON: Okay. And I'd like to
18 move to admit Exhibit I-7, please.

19 JUDGE FRANCKS: I-7 is admitted.

20 (Exhibit No. I-7 admitted.)

21 Q (By Ms. Nicholson) And can you now look at Exhibit I-8.

22 A Okay.

23 Q And can you tell me if that is your expert report
24 submitted in this matter?

25 A Yes, it is.

1 Q I think I would actually like you to start with --
2 let's -- I'm going to -- we're going to start at the
3 beginning, and I'd like you to look at Exhibit I-17.

4 And is this a drawing that you included with your
5 expert report?

6 A Yes, it is.

7 Q Okay. And what I would like you to tell the board this
8 morning is give a little bit of the basics of what is a
9 vadose zone?

10 A Okay. Well, simply stated, the vadose zone -- make sure
11 this button works.

12 The vadose zone is that part of the subsurface that
13 basically goes from ground surface down to what is
14 usually defined as the regional water table.

15 And in this diagram, that's basically here, the
16 ground surface, down to here, the regional water table.
17 (Indicating.)

18 Q Okay.

19 A And with -- sorry.

20 Q Go ahead.

21 A And within the vadose zone, this zone here, it's
22 basically groundwater -- sorry -- water movement through
23 the vadose zone is controlled by unsaturated conditions
24 as compared to the water table down here where it's
25 controlled by saturated conditions.

1 Q So you're saying that -- that, by definition, a vadose
2 zone is unsaturated condition?

3 A Predominantly, yes.

4 Q Okay. So maybe you could explain, in this picture, what
5 is -- what is saturated and what is unsaturated in this
6 little drawing?

7 A In this drawing we have the regional water table down
8 here. That's the saturated zone or the water table or
9 the aquifer.

10 And we've heard a lot about aquifers over the last
11 few days. That's this down here. That's the aquifer,
12 the regional aquifer, underlying the ground surface.
13 (Indicating.)

14 Occasionally, in vadose zones, we will see something
15 called perched water or perched zone in this drawing.
16 That's water that can accumulate on top of a -- what
17 we'll call a low permeability zone within the vadose
18 zone.

19 Water does move through the vadose zone.
20 Occasionally it will collect on a zone where water
21 movement is restricted or impeded, and if there's enough
22 water there, you will achieve a local saturated condition
23 on that, in this case in this diagram a clay bed.

24 We could have drawn more of that in here, but the
25 purpose of this is just to show the basic simple -- the

1 basics or the simple basics for what a vadose zone is.

2 Vadose are made out of a variety of material.

3 Q So the soil in a vadose zone, what you're saying is that
4 it varies?

5 A It varies based on your conditions, yes.

6 Q So what type of soils would you expect to see in a
7 typical vadose zone, say, in Eastern Washington?

8 A Eastern Washington vadose zone will occur in several
9 basic types of strata. Those of you who have driven
10 around the Palouse have seen some of that, the hills out
11 towards WSU and the Palouse, those are all fine silt and
12 sand.

13 That material is typically unsaturated. It's above
14 the water table. That's -- there's a vadose zone in that
15 stuff.

16 Go down into the Pasco basin around the Tri-Cities.
17 If you've gone to the Ice Age Floods Institute museum,
18 you'll see stops that talk about the cataclysmic flood
19 deposits from the great Ice Age floods. That's usually
20 sand and gravel in many cases.

21 In those areas, if it's unsaturated between ground
22 surface and groundwater, those vadose zone will be sands
23 and gravels and intermixed fine grain deposits.

24 Going up into the Yakima Valley, you see other
25 materials that make up the vadose zone, some flood

1 deposits. Mr. Erickson described yesterday ash deposits,
2 a variety of other alluvial material, everything from
3 clay and silts up through sands and the large gravels.

4 So depending on where you're at, your vadose zone
5 typically is some mix of that kind of material, again,
6 depending on where you're at and different types of
7 material present.

8 Q And does that differ for Western Washington?

9 A Western Washington has a lot of the same sandy gravel
10 material. Well, I shouldn't say the same. Western
11 Washington also has silty, sandy, gravelly, and clay
12 vadose zones.

13 One of the things we see a lot more of in Western
14 Washington, though, is, we see glacial outwash deposits,
15 which are -- could range, again, from clays to gravels.

16 We also sometimes see a lot more peat and organic
17 deposits in some of these strata because there's been a
18 different history, a different hydrologic history, on the
19 west side than on the east side.

20 Q Okay. So the vadose zone consists of a lot of different
21 types of -- can I just say soil types? Is that accurate?

22 A Soil types or materials, yes.

23 Q Okay. Okay. And so is it correct to assume saturated
24 means wet and unsaturated means dry?

25 A No. Saturated -- so we'll start with saturated because

1 that's the simplest one. So we've talked about all these
2 materials making up the vadose zone. A saturated
3 interval is that -- is that type of material or that
4 situation where we basically -- let's use sand because
5 sand is very easy to envision.

6 We have sand grains all piled in against each other.
7 In a saturated condition, all the space between the sand
8 is full of water. There's no air bubbles. There's no
9 nothing. There's nothing else there. It's sand grains
10 and water, water filling up all the space between the
11 sand grains.

12 You can take that with the clays and gravels, but
13 it's the same basic concept. The space is full of water.

14 In an unsaturated condition, the space has water in
15 it or can have water in it, but also has air. And when
16 we're in an unsaturated state, water is going to be up
17 against the particles -- and we'll stick with the sand --
18 in a very lowly -- low moisture content situation in the
19 sand, the water is forming a coat or a skim around each
20 of the sand grains except for they touch each other,
21 unless you add more water to that.

22 Q I think we'll get into that in just a second. I'm going
23 to stop you there because it's getting pretty detailed
24 there.

25 A Sorry.

1 Q Let's go back to this figure and just make sure we
2 understand everything that's in here.

3 At the top you have a root zone. This is where, I'm
4 assuming, the plant roots reside?

5 A That would be the plant root zone, yes.

6 Q And you have something called capillary fringe. What is
7 that?

8 A Capillary fringe, it's a common feature in vadose zones,
9 especially where the vadose zones are coming into contact
10 with the saturated zones.

11 And if you had a glass on your table or a water
12 bottle or whatever, you'll actually see it. If you look
13 closely at a clear container of water, you'll see the
14 water in the container.

15 And then you look around the edge of the glass.
16 You'll see where it's lipping up or wicking up along the
17 inside of the cup or the container. That's capillary
18 action or capillary force, forming a capillary fringe.

19 So in the vadose zone or the unsaturated zone where
20 you have water, you will get these capillary forces
21 active, and basically it's the attractive forces, I
22 think, of the hydrogen bond -- trying to bind to the
23 soil particles.

24 And it starts to move upward, outward, moves through
25 the soil column as the water is being attracted or

1 adhering to the sand grains. And in that cartoon there,
2 the capillary fringe, it actually is moving upward, not
3 downward.

4 Q Okay. So just to put this in total layman's terms, the
5 capillary fringe, where water can move up the soil
6 column?

7 A It can move up and laterally.

8 Q Okay. Thank you.

9 So when we're talking about this vadose zone and
10 because we've defined it as a vadose zones, it is
11 unsaturated?

12 A It is dominated by unsaturated conditions.

13 Q We had have a little bit of information already this week
14 about the type of processes that can happen in a vadose
15 zone. So I'm going to name off a couple of those.

16 There's plant uptake that can happen in a vadose
17 zone?

18 A Yes.

19 Q Volatilization?

20 A Potentially.

21 Q Mineralization?

22 A Potentially.

23 Q Coupled nitrification, denitrification?

24 A Potentially.

25 Q So basically the nitrogen cycle happens in this?

1 A Nitrogen cycle is pretty much happening in that vadose
2 zone, yes.

3 Q Okay. Now I'm going to let you go into some of that
4 detail and have you pull up I-18. And this is another --
5 oh.

6 MS. NICHOLSON: Tara is reminding me
7 to admit I-17.

8 JUDGE FRANCKS: I-17 is admitted.

9 (Exhibit No. I-17 admitted.)

10 Q (By Ms. Nicholson) I'll have you look at I-18.

11 A Okay. I'm there.

12 Q Okay. She's not yet.

13 And this is another table from your expert report?

14 A Yes, it is.

15 Q Okay. And I see two different columns or terms depicted
16 on this. That's "field capacity" and "wilting point."

17 I think we might understand what wilting point is,
18 but could you please describe that.

19 A Sure. In vadose zone hydrology -- actually, I'm going to
20 explain the top line first.

21 Q Okay.

22 A The top axis on this graph .1, .2, .3, .4 in vadose zone
23 are unsaturated hydrology. These numbers are very
24 important. That's the moisture content that's present in
25 the material.

1 So with that, what is wilting? That's this line
2 right there. Over here you have a bunch of different
3 materials or grain sizes or soil types.

4 The wilting point is a measure of water content in a
5 material where, when you're less than the wilting
6 point -- so to the left of the line, there's not enough
7 available water for a plant to pull out of the soil
8 matrix into the root to make the plant grow, thus the
9 name wilting point, as it basically is -- as the soil
10 dries out, there's not any water or there's less water
11 for the plant to take up. And at some point it stops and
12 you can see the different materials having different
13 moisture contents.

14 Q Okay. So let me ask you a question. So if you have a
15 clay soil, that wilting point, if you're below a .2 of
16 the moisture level -- is that how -- the correct way to
17 use that?

18 A Approximately.

19 Q -- you've already wilted your plants?

20 A And that .2 equates to 20 percent. Those .1, .2, .3, you
21 can think of those as percentages, 10 percent,
22 20 percent, 30 percent, of volumetric moisture content.

23 Q Okay. So let's talk a little bit about field capacity.
24 You were touching on that a little bit when you were
25 talking about the difference between saturated and

1 unsaturated, but let's --

2 A Correct.

3 Q -- go ahead and hit the details.

4 A Okay. So that other line on this graph is what is called
5 fuel capacity, and that's basically the percent moisture
6 content in a given material.

7 And, again, we have those listed on the side.

8 That's the percent moisture content measured in the soil
9 where you finally -- I shouldn't say finally -- where you
10 have enough water in the soil to begin to have that water
11 move.

12 So if we use loam or silt loam -- I'll pick that
13 because it's right in the middle -- if the water content
14 in the loam is less than 28, 30 percent, whatever that
15 number is -- it's not a very detailed graph, but it's
16 good for this purpose -- if the moisture content is below
17 that 30-odd percent on this graph, water will not be
18 moving in the vadose zone.

19 Once moisture content exceeds the field capacity for
20 that material, water -- water can begin to move. It's
21 not all moving. It's the water that's not adhering to
22 the particles that's moving.

23 So you would not flush every piece of water out of
24 that column. You'd actually have some fraction of the
25 water present begin to move.

1 And these are all unsaturated numbers. You won't --
2 when you finally get to saturation where all the core
3 space is, again, full of water, and that's where you have
4 an aquifer or saturated conditions or full water
5 movement.

6 Q Okay. So kind of want to go back to the first drawing,
7 which is I-17, and imagining this vadose zone, with some
8 of those different strata you're talking about because
9 it's never homogeneous; is that right?

10 A No. It's never homogeneous.

11 Q Okay. So you have all these different type of strata,
12 and they -- each one of them has a different field
13 capacity?

14 A If it's a different strata, it would have a different
15 field capacity.

16 Q Okay. So if moisture slips down below the root zone, in
17 a vadose zone, which, by definition, is unsaturated --

18 A Correct.

19 Q -- will it just continue down like an elevator to
20 groundwater?

21 A Moisture won't move until you exceed field capacity.

22 Q So it would depend on what type of soil in that vadose
23 zone?

24 A Correct.

25 Q And whether that particular soil type has reached field

1 capacity?

2 A Correct.

3 Q Before it moved down?

4 A Before it goes any further.

5 Q Goes any further. Okay. Thank you. That's helpful.

6 MS. NICHOLSON: I think what I want to
7 look at now -- yes. Would you -- can we move to admit
8 I-18, please?

9 JUDGE FRANCKS: I-18 is admitted.

10 (Exhibit No. I-18 admitted.)

11 Q (By Ms. Nicholson) We have one more piece of
12 information, on I-19.

13 And this, again, is another expansion from your
14 expert report?

15 A Yes, it is.

16 Q And what is this showing us?

17 A Okay. So this is a graph of an example of how you
18 actually determine hydraulic conductivity for a material
19 under an -- it's a representation of the data that goes
20 into how to portray or identify the hydraulic
21 conductivity or movement rate of water through an
22 unsaturated media.

23 And there's literally a binder full, books full of
24 these things that people have put together over the years
25 for everything they've been working on.

1 So this is an idealized picture.

2 Q Okay. One second. So this is one -- this is one
3 example -- like, this is one soil type?

4 A This is -- this would be one graph prepared for one soil
5 type.

6 Q Okay. So this is -- if we imagine just one little
7 strata, this would be one of those?

8 A It would be one of those.

9 Q And it's showing us again --

10 A What it shows -- and we mentioned earlier percent
11 moisture to talk about the wilting point in the field
12 capacity. Once we've reached field capacity and can
13 begin movement, we still want to use our percent
14 moisture.

15 And that's this bottom axis now. And, again, zero,
16 no moisture; 2.2, 20 percent; .4, 40 percent, moisture by
17 volume.

18 And we're in the unsaturated state. If we know our
19 moisture content and we know our material type and we've
20 built these characteristic graphs or have access to these
21 characteristic graphs, we can decide, by just reading the
22 graph, what our likely un- -- shouldn't say likely --
23 what our unsaturated hydraulic conductivity is or
24 unsaturated water velocity.

25 And this material, which is probably sand,

1 20 percent volumetric moisture, read up to the graph,
2 come across, we have a ten to the minus second hydraulic
3 conductivity.

4 If this was for a material that we had done the lab
5 work on, it would be centimeters per second, feet per
6 day, whatever the units are.

7 Q Okay. I'm going to stop you again. We're going to
8 simplify a little bit here.

9 So these numbers, ten to the minus two --

10 A Mm-hm.

11 Q -- are we -- this is reminiscent of some of the seepage
12 rates that we've been talking about?

13 A It is.

14 Q I just want to tie this all together. If we -- on this
15 matter, if we have a .2 moisture for this material,
16 whatever it is --

17 A This material.

18 Q -- that means that at ten to the minus two, it's not
19 going to go through; is that correct?

20 A Well, it means at that 20 percent moisture --

21 Q -- it would stop?

22 A The -- only if you've not exceeded field capacity.

23 20 percent moisture, your hydraulic conductivity is ten
24 to the minus two, which is always less than your
25 saturated conductivity.

1 Q So because this is reminiscent of what we see and we've
2 been talking about Darcy's law, I'd like to turn to that
3 next.

4 First let's pull up our -- excuse me -- R-5.

5 MS. NICHOLSON: And move to admit
6 Exhibit 19, please, I-19.

7 JUDGE FRANCK: I-19 is admitted.

8 (Exhibit No. I-19 admitted.)

9 MS. NICHOLSON: Thank you.

10 Q (By Ms. Nicholson) And if you could turn to R-5 on
11 Page let's say 26, 27, I believe, and in the PDF --

12 A I'm in the wrong binder.

13 Q Yes, you are. So you want the green binders, and you'll
14 leave that one out.

15 A Okay. I'm in R-5. Page?

16 Q Page 27 for you, and PDF, it should be 39.

17 A There it is. I'm there.

18 Q Okay. And what do you see on that page?

19 A I see an equation, the Q equals KA, et cetera.

20 Q And what is that equation?

21 A That's a Darcy representation of how to calculate the
22 movement of water downwards, in this case, probably
23 through a media.

24 Q And I neglected to ask you what this particular document
25 is. It's already been admitted.

1 A It's the groundwater implementation guidance document
2 from Ecology.

3 Q And I believe that we heard earlier testimony from
4 Ecology that this is one of the documents they relied on
5 too?

6 A Yes. It's the document I use.

7 Q Okay. So looking back on Page 27, or 39 in the PDF, did
8 you see anything regarding this equation that caught your
9 attention?

10 A Yeah. We ran into kind of an interesting math error.

11 Q And was this in your expert report as well?

12 A Yes. We described it in the report.

13 Q Okay. Can you describe in simple terms what the math
14 error is.

15 A Sure. I'll break the equation up into its basic three
16 component pieces, based on my recollection from algebra
17 in sixth grade or whenever that was.

18 Q on the left. Q on the left. This cluster of
19 terms here between the equal sign and the minus --

20 Q Wait. You skipped over what Q is.

21 A I'll come back to that.

22 Q Okay.

23 A I was breaking it up into the three component parts.

24 Q Okay. Thank you.

25 A Q, this cluster of terms between the equals and minus,

1 and then ET, which is the evapotranspiration on the
2 right.

3 So Q is what we're solving for. It's the discharge
4 number, and we've talked a lot about discharge over the
5 last several days. It's a volume per unit time.

6 For the purposes of this discussion, I'll use cubic
7 feet per day, which we can convert to gallons, but I'm
8 not. Cubic feet per day of volume per unit time. So
9 that's what we're solving for, a volume per unit time.

10 The middle cluster of terms K, A, D, L, you solve
11 for those putting the units in them -- and A is actually
12 the unit of interest -- we get a volume per unit time in
13 that middle part of the equation.

14 So volume per unit time, which we're calculating
15 for, is equal to the calculation that gives you the
16 volume per unit time.

17 What we ran into, though, when we were using the
18 equation, is the ET function. If you go to the
19 definition of ET down below, it's ET equals
20 evapotranspiration rate.

21 Rates are usually expressed as a linear distance per
22 unit time. Since I'm using cubic feet per day, I'll say
23 it would be a foot per day number.

24 And the math error comes -- you can't -- you can't
25 subtract a linear rate, foot per day, from a volume rate,

1 cubic feet per day, without first correcting the ET to
2 include that area function so you can turn it into an
3 area per unit -- or a volume per unit time.

4 Q Okay. I'm going to sum up what you just said.

5 A Okay.

6 Q We basically have a unit problem; is that --

7 A We have a unit problem.

8 Q Because the units don't all match?

9 A The units do not match.

10 Q So you can't subtract one of these from the other because
11 the units don't match?

12 A Not until you correct the equation.

13 Q That sounds like a minor issue. Is that a minor issue
14 here?

15 A Well, if you're not paying attention to the units and
16 you're just plugging your numbers in, because everything
17 but the Q would have a number -- your K would have a
18 number. Your A would have a number -- if you don't catch
19 your units, you'll end up subtracting -- when you solve
20 the middle cluster of terminology, you'll end up
21 subtracting a fairly small number from that because ET
22 through most of the region is usually fractions of an
23 inch to maybe an inch per day if it's 115 degrees out.

24 But the numbers that you'd calculate in the middle
25 could be thousands -- hundreds, thousands, or tens of

1 thousands because you have that area function in there.

2 We've talked about lagoons that may cover two or
3 three or four acres, which would be tens of thousands of
4 square feet. So you got a big number minus a very little
5 number that we forgot to correct.

6 Q So -- and if anyone relied -- including Ecology, relied
7 on this equation to calculate seepage from the bottom of
8 a lagoon liner, what would happen?

9 A If you don't add -- if you don't multiply ET by area, you
10 will get an overestimate of Q.

11 Q And so that means that there is an overestimate of the
12 amount of seepage coming out the bottom of a lagoon
13 liner?

14 A If you didn't catch your units, yes.

15 Q Okay. Thank you.

16 So I want to talk a little bit about the application
17 of using a Darcy equation in a vadose zone, which, again,
18 is an unsaturated --

19 A It's an unsaturated system.

20 Q Okay. Maybe you should just discuss, what are the
21 assumptions built into the Darcy equation?

22 A Darcy -- the Darcy equation is the standard for
23 describing or calculating the movement of water through
24 the subsurface.

25 But Darcy's basic assumptions are, you assume you

1 have saturated flow. All of our core space is full of
2 water. We assume we have continuity from wherever we're
3 trying to measure our water movement, Point A to Point B.
4 And by "continuity," we basically mean there's a way for
5 the water to get from one point to another.

6 And we assume we have a head driver. We have to
7 have head to push it. A lot of times we'll calculate a
8 constant head. This equation assumes a constant head.
9 And that's fine.

10 So those are the assumptions behind how to use
11 Darcy, and what you will probably hear me now say in a
12 few minutes, unmodified Darcy.

13 Q Unmodified Darcy. So can we flip back to I-17, which is
14 the picture. Yes. You can just use the screen.

15 A Chasing the binders around.

16 Q So this picture includes a lined lagoon?

17 A Mm-hm.

18 Q So what -- when you're talking about the assumptions that
19 are built into Darcy in a vadose zone, what are the
20 assumptions that would be in play for this lined lagoon,
21 applying the Darcy equation in this vadose?

22 A If we are -- I think we've talked about a fair amount
23 over the last few days.

24 In the Darcy equation, if we assume saturation and
25 we're calculating flux or seepage of water through liner,

1 we will be assuming the liner is fully saturated from
2 this top to its bottom. If it is not fully saturated,
3 then we have to start modifying Darcy.

4 Q And are you also assuming in the pressure or constant
5 head, I believe you said -- are you assuming that the
6 lagoon has sufficient feet of liquid in it to provide
7 pressure?

8 A Well, yes. I mean, if there's liquid in it, there would
9 be a pressure measure related to how much liquid is in
10 the lagoon.

11 Q Now, have you worked on dairies?

12 A Some, yes.

13 Q Yes. And have you had an opportunity to observe their
14 operations and speak with dairy farmers?

15 A I have from time to time, yes.

16 Q And what sort of things did you do on the dairy farms?

17 A Most of our dairy work over the years has been focused on
18 groundwater monitoring plan preparation, groundwater
19 monitoring plan implementation, data collection,
20 reporting, some vadose zone work, but subsurface
21 hydrogeology.

22 Q Okay. And in your work on dairy farms, have you observed
23 that all manure -- have you observed manure lagoons?

24 A Yes. Some.

25 Q And would it be an assumption that all manure lagoons are

1 full all the time?

2 A I wouldn't make that assumption, no.

3 Q In your observations, was that --

4 A Based on my experience, yes.

5 Q Okay. And why was that?

6 A Because I've seen lagoon levels go up and down with time.
7 One day it's at one level. Visit it sometime later, it's
8 a different level.

9 Q Is that because operationally they're using that liquid
10 in a different operation?

11 A When I've had those conversations with, "Hey, what's
12 going on?"

13 "We drained it for irrigation. It was time to land
14 mine."

15 Okay. Different water level, different manure
16 liquid manure level in the lagoon, different head, and
17 we've talked about that earlier.

18 Q Okay. So continue on in that same thought. We have
19 different head.

20 By "head," you mean pressure?

21 A Pressure, yeah.

22 Q Okay. So if you cannot assume that the lagoon has a
23 steady amount of pressure, can you assume that the liner
24 beneath that lagoon is fully saturated all of the time?

25 A I would be -- I would -- I would be careful with that

1 because, if our head driver is changing, that means we
2 have greater or lesser head pushing fluid through the
3 liner. So the liner saturation might be changing in
4 response to that changing head.

5 Q Okay. And lastly, can you assume a saturated condition
6 in a vadose zone?

7 A No. You wouldn't assume a saturated condition in a
8 vadose zone because then it wouldn't be a vadose zone.

9 Q By definition, it would not be?

10 A By definition, it's unsaturated.

11 Q So basically, in applying Darcy to a lined lagoon to
12 determine the amount of seepage coming out of saturated
13 liner, the assumptions are that there is a constant
14 pressure in the amount of liquid in the lagoon, that the
15 liner is always saturated, and because Darcy unmodified
16 applies -- doesn't apply to a vadose zone, they're
17 assuming a saturated condition; is that correct?

18 A Pretty close.

19 Q You can correct me.

20 A To use Darcy to estimate how much water might be seeping
21 through the liner, you can use it as a constant head.
22 We've heard a lot about -- the past few days how the
23 lagoon is always the same level.

24 If your head is varying but you've already
25 established that the liner is saturated, you can actually

1 calculate the flux of the liner -- all the available
2 heads it might have, so low level, high level, and levels
3 in between.

4 Q Okay. But in -- have you talked with Ecology about their
5 assumptions in applying Darcy in this situation?

6 A I've talked to some Ecology over the years about applying
7 Darcy to vadose zone, yes.

8 Q And what were their assumptions?

9 A It's --

10 MR. SNYDER: Objection to the extent
11 this calls for hearsay.

12 MS. NICHOLSON: These are
13 conversations he's had.

14 MR. SNYDER: About what Ecology said,
15 that's hearsay.

16 JUDGE FRANCKS: Well, he can testify
17 about what his understanding is.

18 A My understanding from those conversations was that, yes,
19 Ecology staff acknowledged unsaturated conditions are an
20 important part of fluid flow through the vadose zone, but
21 it's very difficult to deal with.

22 In a lot of cases, they'll assume that they don't
23 have the data to deal with it, so they won't. They'll
24 just stick to kind of a Darcy saturated type of estimate.

25 MR. SNYDER: Objection, Your Honor. I

1 would move to strike the previous testimony. That's
2 hearsay.

3 MS. NICHOLSON: I believe she ruled on
4 that.

5 JUDGE FRANCKS: I ruled on that, and
6 we are in a situation with our rules that hearsay is
7 admissible if it's the type of information that a
8 reasonably prudent person would rely upon.

9 But when I make a ruling, I'd like you to stand by
10 it and not do double objections.

11 MR. SNYDER: Thank you, Your Honor.

12 Q (By Ms. Nicholson) So in applying -- I'm just going to
13 get back to the -- back to the application of this
14 Darcy's law.

15 Are those assumptions correct? Is it correct to
16 apply Darcy, using those assumptions, when you know that
17 that is incorrect?

18 A Shouldn't apply unmodified Darcy, which assumes saturated
19 state. You shouldn't be using it in an unsaturated
20 state.

21 Q And that's, again, because we can't assume that there's
22 constant pressure pushing the water down, and, therefore,
23 we can't assume that the liner is fully saturated; is
24 that correct?

25 A Well, you can assume if you can -- if you can establish

1 that the liner is fully saturated, you can assume that,
2 but in the vadose zone, which is, by definition,
3 unsaturated, you cannot apply Darcy without modifying for
4 the unsaturated state.

5 Q Okay. So what could you use for an unsaturated
6 condition? What would properly be used?

7 A A modification of the Darcy equation.

8 Q And what would that modification be called or what would
9 you --

10 A You use something called the Richards equations, which
11 are estimating what the unsaturated conductivity would be
12 for specific material at a specific moisture content like
13 we discussed in these previous graphs.

14 You can calculate for that, and a lot of times --
15 again, there's a number of papers and books that apply to
16 standard plots for all kinds of material.

17 So you can probably -- in a lot of cases, you can
18 probably look up what is my unsaturated conductivity for
19 some material, assuming you know what your unsaturated
20 moisture content is.

21 Q Okay. So did Ecology make any of those modifications in
22 the background, the basis for their permit terms?

23 A Not that I can see, no.

24 Q Not that you have observed.

25 And let's just take one of these assumptions. What

1 is the consequence of assuming a constant head of
2 pressure? A constant lagoon level?

3 A Right.

4 Q In calculating the amount of seepage that could come out
5 of the bottom of the lagoon?

6 A Right. We actually have an example calculation in our
7 expert report where we made -- went ahead and made the
8 assumption.

9 We have a ten to the minus six centimeter per second
10 saturated liner with a constant head on it, and we
11 actually used a 365-day calendar.

12 And we -- I don't recall the numbers. I'd have to
13 look in the report. I think we used 14 feet of head and
14 applied that through the equation we had up above with
15 the ET correction in it and determined, based on that
16 constant head, based on Darcy and the assumption that you
17 have a one times ten to the minus six saturated liner,
18 how much water comes out the bottom.

19 And we get a number doing that.

20 We were curious, though, because, when we observe
21 lagoons go up and down through the course of an operating
22 year, does the number end up being different?

23 So we took the exact same dimension and size of a
24 lagoon we used in the constant head example -- and I'll
25 call it the constant head example -- and applied a

1 variable head to it on a daily basis.

2 So we kept it pretty simple. We took -- made an
3 Excel spreadsheet, put 365 days in it, after talking to
4 some dairy operators about, well, how do you use these
5 things, we got some scenarios for when they fill them,
6 when they drain them, when do they stay constant, and
7 applied that to this hypothetical lagoon.

8 Ran through the calculation every day for the
9 365-day calendar year and got an answer for that lagoon,
10 that -- well, constant head overestimated the flux
11 through the lagoon liner by 20, 21 percent.

12 Q And --

13 A Whereas, if we change the head through the course of the
14 calculation, we would have had less seepage through the
15 liner.

16 Q Okay. So you saw 21 percent difference in the
17 calculations that you ran.

18 Is that a 21 percent overestimation of the moisture
19 that would come out of a saturated lagoon?

20 A In that example, yes.

21 Q And is that a significant difference?

22 A Yeah. I thought it was a pretty big number, yes.

23 Q Okay. Thank you.

24 One thing that -- one thing that we've heard
25 repeatedly throughout the week from Ecology and from

1 Mr. Erickson is that all lagoons leak.

2 Do you agree with that statement?

3 A I wouldn't agree with that absolute statement, no.

4 Q And why not?

5 A Well, as you apply the unsaturated and saturated flow
6 equations, as you apply the changing head conditions, as
7 you look at -- doing liners or the whole vadose zone?

8 Q You can do liners.

9 A Okay. As you look at those variables, those variables do
10 change with time. As those variables change with time,
11 you may achieve states where the lagoon liner has stopped
12 seeping.

13 Reduce the head. There's no head driver. There's
14 no reason to push water out the bottom.

15 Q So in other words, even though a liner may have the
16 capability of seeping, it isn't necessarily seeping all
17 the time?

18 A That would -- that was my conclusion. They have the
19 potential, but then you don't always seep. Don't always
20 seep.

21 Q Thank you.

22 So I think you've described two different ways where
23 we have an overestimation of seepage out of a lagoon
24 liner.

25 And can you sum those up for us.

1 A By going with the constant head scenario, you stand a
2 chance of overestimating discharge through a liner or
3 seepage through a liner.

4 You should look at the -- how the lagoon actually
5 operates to make sure you're not overestimating.

6 And by simply sticking to the saturated state only,
7 we will get a higher permeability or hydraulic
8 conductivity that may not apply -- well, will not apply
9 in an unsaturated state because, in an unsaturated state,
10 those numbers are almost always lower.

11 Q Okay. And I believe we've heard testimony again from
12 Ecology that they're relying on the -- you were talking
13 about -- a little bit about the math error problem.

14 They're relying on that math error, the equation
15 with the math error, to calculate seepage and the
16 termination that all lagoons leak.

17 And was that true of Dr. Erickson's testimony as
18 well?

19 A Seemed to be, yes.

20 Q Okay. Thank you.

21 Did you have the opportunity to watch the hydrous
22 model movie in Dr. Erickson's testimony?

23 A Yes, I did.

24 Q And did you review Dr. Erickson's report?

25 A I read it, yes.

1 Q And remember that he had visual of that hydrous model in
2 the report as well?

3 A Yes, he did.

4 Q And you read that?

5 A Yes.

6 Q Are you familiar with hydrous model?

7 A I'm familiar with hydrous model, yes.

8 Q That's something you use in your job?

9 A Something we use in our job, yes.

10 Q Fairly frequently?

11 A We use it enough.

12 Q And you heard Mr. Erickson's testimony based on his --
13 about his hydrous model?

14 A Yes.

15 Q Based on his report and his testimony this week, what
16 information did Mr. Erickson's hydrous model convey?

17 A I didn't get anything out of it, frankly.

18 Q And why is that?

19 A Well, when we've used hydrous models, a couple important
20 things we do with them, number one, what is the moisture
21 content of the soil column you're working with?

22 You have to have moisture content for your soil
23 column because hydrous is calculating moisture content
24 for the soil column.

25 And to confirm that the model is working correctly,

1 you have to match its output to the actual field
2 conditions in a process that's called calibration.

3 If you can't get the model to match the actual field
4 conditions, then there's probably some assumption you
5 made in your construction of your model that doesn't
6 allow it to calibrate and meet those conditions.

7 And in both the report and in the presentation
8 yesterday, it's blending together -- in the presentation
9 yesterday, there was no evidence that there was any
10 calibration done at all.

11 So it's really, as any model -- and we run into that
12 in hydrogeology all the time. Uncalibrated models are
13 exercises to make a point. They're not exercises to
14 portray a natural system.

15 Q And is that how hydrous is used normally?

16 A No. Hydrous -- if you want to use hydrous properly, you
17 would have your field conditions. You have your moisture
18 conditions. You have your stratigraphy.

19 And that was another problem with the model. It had
20 a homogeneous media except for that one clay bed, and it
21 was a -- it was a fiction. It didn't have calibration.
22 It didn't reflect reality. It didn't have moisture
23 content, and that's not how you're supposed to be using
24 hydrous.

25 Q Have you ever seen anyone use a hydrous model in the way

1 that you saw it portrayed this week?

2 A I have not, no.

3 MS. NICHOLSON: I believe that's it,
4 Your Honor.

5 JUDGE FRANCKS: Okay. Why don't we
6 take our lunch break now, and then we will proceed with
7 Dr. Lindsey's cross-examination.

8 MR. TEBBUTT: Ms. Francks, just a
9 question about the demonstrative. Should we move that in
10 as A-82?

11 JUDGE FRANCKS: If it's a
12 demonstrative, no. Then it's not an exhibit.

13 MR. TEBBUTT: But it should be in the
14 record. Let me ask if we can introduce it as A-82 then
15 so the board would have it to refer to.

16 JUDGE FRANCKS: No.

17 MR. TEBBUTT: You're denying any use
18 by the board in the future of this?

19 JUDGE FRANCKS: It was a demonstrative
20 during the hearing. It wasn't introduced under the
21 exhibit list. The other parties haven't seen it.

22 MR. TEBBUTT: Okay. Just want to
23 know. Thank you.

24 JUDGE FRANCKS: Thank you. We're off
25 until one o'clock. Off the record.

1 (Recess from 11:55 a.m. to
2 1:02 p.m.)

3 JUDGE FRANCKS: Please have a seat.
4 Let's go back on the record.

5 I have two housekeeping matters before we get
6 started. I just wanted to clarify our discussion right
7 before lunch about the drawing on the easel that
8 Mr. Erickson did.

9 So what I was ruling was what can happen and what
10 will happen is, it will be available to the board.
11 Obviously the board members were here for that testimony.

12 What I was not allowing was it to be marked as a new
13 exhibit that then would be in the record and would go up
14 on appeal and all of that. So that was -- I just want to
15 be clear about that.

16 MR. TEBBUTT: Okay. I was just going
17 to suggest that you mark it but call it a demonstrative
18 only. That's been my experience about how it's done, but
19 that's okay.

20 JUDGE FRANCKS: I think we are clear
21 about what's demonstrative and what's not. So I think
22 we're good with it where it is and we --

23 MR. TEBBUTT: So we won't -- we'll
24 leave it for you guys.

25 JUDGE FRANCKS: We'll keep it with our

1 stuff. So that's the first thing.

2 Second thing, as you can see, Board Member Marchioro
3 is not with us and won't be with us because she has a
4 prior commitment.

5 But what she will do and what we've done in other
6 cases is, she will listen to the recording, and she will
7 participate in the additional days, and she will be
8 deciding this matter with the board. Just so you know
9 where she is.

10 Okay. Carry on with Dr. Lindsey, Ms. Barney.

11 CROSS-EXAMINATION

12 BY MS. BARNEY:

13 Q Good afternoon, Dr. Lindsey.

14 A Afternoon.

15 Q I actually just have a couple of questions for you.

16 First, if Mr. Tebbutt will allow me to testify,
17 Ecology acknowledges the typographical error on the Darcy
18 equation in Exhibit R-5, and Ecology is obviously aware
19 of that error.

20 The title of your expert report, which is
21 Exhibit I-8, just take a quick peek at the first cover.

22 I'm just looking at the title, "Hydrogeologic Issues
23 Associated with the CAFO NPDES and State Waste Discharge
24 General Permit Support to Washington State Dairy
25 Federation on PCHB Case No. 17-016C."

1 Did you, in preparation in this report, review the
2 permits -- permit documents themselves?

3 A I've read them, yeah.

4 Q Can you direct us to any place in those permits that
5 actually utilized or requires a calculation based on the
6 Darcy's law equation?

7 A Well, I'll have to go look at it again.

8 Q Okay. That will be Exhibits R-1 and R-2 --

9 A Okay.

10 Q -- which are in the green binders.

11 A Got it right there. My -- well, before I say anything,
12 let me go through it.

13 Okay. So I found a cite -- so I'm at a reference to
14 the implementation guidance.

15 Q Can you direct us to the page you're on, sir.

16 A I am on Page 33 of the document itself.

17 Q Which will also be Page 33 of the permit of the PDF.

18 A Yeah. Yeah. It's the Page 33, middle bottom.

19 Q Okay.

20 A It just says X R-1 on the lower right, so -- in this
21 copy.

22 Q And you said we're on Page 33 of the permit?

23 A Of this document that's in front of me, yes.

24 Q Which is R-1?

25 A Yes.

1 Q Thank you.

2 A Okay. So ask the question again.

3 Q Yes. The question was, if you could direct us to where
4 in the permit calculations based on Darcy's law as
5 required by the permit.

6 A Okay. We've -- this section -- I'd have to look and see
7 if there are other sections as well referred to that
8 document.

9 That document provides a loading calculation or a
10 way to estimate a load from surface structure of the
11 lagoon to the subsurface for the purposes of building a
12 groundwater monitoring program. At least that's my
13 understanding of it.

14 By referring back to the implementation guidance and
15 looking at the Darcy equation in there and my
16 understanding of vadose zone hydrology, that's why we
17 talked about how one needs to correct the Darcy equation
18 for unsaturated equations because this document, if
19 somebody was reading it, would be going back to the
20 implementation guidance and possibly looking at a
21 calculation or an estimation of loading that may
22 overestimate what could be going on.

23 Q So -- and you're looking in provision S.5.D?

24 A Correct.

25 Q So this directs them to the implementation guidance, but

1 doesn't this permit condition actually direct them to
2 develop a plan for groundwater monitoring?

3 A Yes. It is saying, if you're doing that, you have to go
4 to the guide to build your program.

5 Q Right. And then the plan is submitted to Ecology to
6 address the conditions?

7 A Yes.

8 Q So your interpretation of that is that this permit
9 requires the use of that Darcy's equation?

10 A My interpretation of at least this paragraph would be, if
11 you're going into that realm and you're going to have to
12 start dealing with that kind of issue, that you should be
13 aware that Darcy doesn't apply in an unsaturated
14 condition and your vadose zone above your groundwater, if
15 that's what you're dealing with.

16 MS. BARNEY: Okay. Thank you. I have
17 no further questions.

18 JUDGE FRANCKS: Mr. Snyder?

19 CROSS-EXAMINATION

20 BY MR. SNYDER:

21 Q Good afternoon, Dr. Lindsey.

22 A Hello.

23 Q I believe, sir -- and I only have a few questions for you
24 too.

25 So I believe you testified earlier this morning

1 about the movement of water in the vadose zone and how
2 that movement can be either reduced or eliminated in
3 certain circumstances.

4 A Mm-hm.

5 Q Could you tell me again what those circumstances were.

6 A Moisture movement through the vadose zone will stop when
7 the volumetric moisture content of material you're
8 looking at drops below the field capacity.

9 Q So is it fair to say it's tied to what the field capacity
10 of the soil is?

11 A Field capacity has a significant effect on groundwater
12 movement through the vadose zone.

13 Q And what are some of the surface activities that can
14 cause field capacity to rise?

15 A Field capacity for a given material does not change.

16 Q So what are some of the surface activities that can cause
17 soil moisture to increase such that you would have
18 movement of water in the vadose zone?

19 A Apply the water on the surface, if it's into the
20 subsurface and results in the material it's encountering
21 having a higher volumetric moisture content than that
22 particular field capacity, movement will occur.

23 Q So would irrigated agricultural fields be one type of
24 activity that could cause that?

25 A Sure. I guess. Potentially.

1 Q And what about fields that receive yearly manure
2 applications?

3 A I would assume so, yes.

4 Q How about for areas that receive substantial
5 precipitation, say, as in Western Washington?

6 A That's another way to get water on the surface, yes.

7 Q And what about in Eastern Washington where we can have
8 large storm events and snow?

9 A That is another source of water on the surface.

10 Q And would it also be true for areas underlying an
11 actively used lagoon for storage?

12 A If water is moving out of the liner into the vadose zone,
13 there would be water in the vadose zone, and then, as it
14 starts to move and dissipate through the subsurface, if
15 it drops below field capacity, it will stop moving.

16 Q Does your opinions about this topic depend upon the depth
17 of the vadose zone as it pertains to the top of the
18 aquifer?

19 A The vadose zone -- my opinion about the vadose zone is --
20 doesn't change, no matter how thick the vadose zone is.

21 Q If you have a shallower vadose zone or a -- if the
22 distance in the vadose zone to the groundwater table is
23 less, does it change at all how much water needs to be
24 applied before that water will reach the groundwater
25 table?

1 A It doesn't change the physical properties of that vadose
2 zone.

3 Q Does the time from which a water molecule that enters the
4 surface change, depending on the depth of the vadose zone
5 to the time it reaches groundwater?

6 A I'm not sure I follow.

7 Q Sure. So let's say we have a very shallow aquifer.

8 A Okay.

9 Q And so would you agree in that circumstance the vadose
10 zone is smaller?

11 A Vadose zone is thinner than if it was a deeper aquifer.

12 Q Thinner might be a more appropriate word. Thank you. I
13 appreciate that clarification.

14 In that circumstance, would you expect the travel
15 time of water to the aquifer to be less or more?

16 A Again, I'd defer to the material properties present.
17 Travel time is based on material properties and moisture
18 content.

19 Q Even assuming those to be static, if you had a larger --
20 a longer distance to the groundwater table, does that
21 impact the time it takes for a water molecule to go from
22 the surface to the groundwater?

23 A When you say "static," I'm not sure what you mean.

24 Q Homogenous.

25 A So are you saying same material, two locations?

1 Q Sure.

2 A Same material, two locations, it's still the same
3 physical material. So the grain size is the same.
4 Moisture content is still the driver. As moisture
5 content changes for that material, its unsaturated
6 hydraulic properties wouldn't change.

7 Q And how does that impact travel time again? That's what
8 I'm trying to get to.

9 A Oh, a higher unsat K will move faster than a lower
10 unsat K.

11 Q And does that also depend on the depth of the
12 groundwater? If you have a shallower groundwater table,
13 the travel time would be less, given the parameters we
14 just established?

15 A If it's the same velocity in two situations, if it has a
16 shorter travel distance, it will be less time.

17 Q Thank you, sir. And in light of what you just talked
18 about in terms of various soil media and having different
19 hydraulic activities, as a hydrogeologist, how would you
20 go about determining what is in the subsurface, what the
21 various different types of soil media are?

22 A There's a few ways you can go forward with that. If you
23 do your site well enough, previous investigations, other
24 subsurface information, you could look at that
25 information, that data.

1 And I mentioned quite voluminous literature has been
2 published on all of these grain size distributions, all
3 of these moisture contents. You could go about doing it
4 basically as a book study, if you will, and try to
5 determine what -- what that subsurface would look like.

6 Of course, if -- so that's one way to go about it,
7 do it as a book study, look for your grain size
8 information from that, match it to what you think is
9 going on at the surface, make your water content
10 assumptions that way.

11 And you could take that -- you could take that
12 through to a subsurface investigation where you're
13 physically collecting data samples that give you the soil
14 properties and material properties and the volumetric
15 moisture contents --

16 Q Thank you, Dr. Lindsey.

17 A -- to end members, if you will.

18 Q Are you done?

19 A I'm done.

20 Q Great. Thanks.

21 And I heard you mention subsurface investigations.
22 In your experience, what type of subsurface investigation
23 would you do?

24 A If for -- if you had to go into the subsurface for some
25 reason, you'd use some sort of drilling and sampling

1 program.

2 Q Would that be --

3 A Designed to collect that type of material.

4 Q Would that be similar to groundwater monitoring wells?

5 A It's a subsurface boring. It may or may not be built out
6 as a well.

7 Q And in your experience -- let me just back up.

8 You do have experience installing monitoring wells
9 around CAFOs; is that right?

10 A Some, yes.

11 Q And in your experience of doing that, do you take boring
12 logs to determine what subsurface media you encounter
13 along the way before you reach groundwater?

14 A If I was in a drilling program, participating in a
15 drilling program, I would record the subsurface
16 information.

17 Q Is that required, in your experience, under the WACs for
18 environmental monitoring wells?

19 A I'd have to go back and look at 173-160, but I would
20 assume it has something in there about recording
21 subsurface conditions, yes.

22 Q Have you ever installed a groundwater monitoring well
23 where you have not identified the subsurface conditions
24 before reaching the aquifer?

25 A Whenever we've drilled, when we've done sub-geologic

1 logging of what we've encountered.

2 Q Thank you, sir.

3 A Collected samples.

4 Q Just want to follow up briefly on Ms. Barney's questions
5 about Darcy's law and as it pertains in the permit
6 itself.

7 And I believe you testified you reviewed the
8 permits; is that right?

9 A I've looked at the permit, yes.

10 Q When you looked at the permit, is there anywhere in the
11 permits that discuss allowable or disallowable seepage
12 rates from lagoons?

13 A I'd have to go back and read it in more detail. I
14 don't -- I haven't read it in a while. We've talked a
15 lot about one times ten to the minus six centimeters per
16 second over the last few days. I don't recall if that's
17 allowable or not allowable.

18 Q But one times ten to the negative six or negative seven,
19 whatever we want to talk about, that's a permeability
20 rate; right?

21 A That is a permeability rate, right.

22 Q Is that the same thing as a seepage rate?

23 A It's being used interchangeably, at least that's been my
24 observation over the last several days.

25 Q Perhaps we should change the terminology some.

1 Do you understand the concept of a specific

2 discharge?

3 A I've heard the term, yes.

4 Q And that speaks to what is actually being allowed to

5 discharge?

6 A Exit.

7 Q Exit, yes. Is that fair?

8 A Yeah.

9 Q Is there anything in the permit that talks about
10 allowable or disallowable specific discharge rates from
11 lagoons?

12 A I'd have to go --

13 Q Do you want to take a minute to -- want to take a minute
14 to do that?

15 A Yeah. I'll look. I don't know if I'll spot it. Number
16 of pages.

17 Q And just in R-1 is fine.

18 A Yeah. Okay. Using the table of contents, point me to a
19 page.

20 Q I'm actually asking you, sir. In your review of the
21 permits, did you see anything like that?

22 A I don't remember.

23 Q Is it possible there's not one?

24 A I suppose it's possible, yes.

25 Q Is that something you would have probably noticed in your

1 view of the permits, given what you've been asked to
2 opine about in this case?

3 A I would have noticed it in a permit, I suppose, yeah.

4 Q Regarding your use of unmodified versus modified Darcy
5 law -- and just for the board's clarification, we talk
6 about unmodified, we're talking about Darcy's law in
7 saturated conditions; right?

8 A Correct.

9 Q And modified would be adding some parameters to account
10 for unsaturated conditions?

11 A Correct.

12 Q And I believe you testified earlier about running some
13 calculations and determining that Ecology seems to have
14 used the assumption that results in overestimating lagoon
15 seepage. Do you remember that, 21 percent?

16 A Oh, right. That was -- that was more related to the
17 constant head versus nonconstant or nonsteady state head
18 assumption.

19 Q But the transient head idea?

20 A Correct.

21 Q Where the lagoons fill and --

22 A Fill and don't fill, fill and drain, fill and drain, yes.

23 Q Okay. Would you mind turning to your expert report, sir.
24 That's Exhibit I-8, and specifically Page 11, please.

25 A Okay.

1 Q In doing your calculations here, can you tell the board
2 how many cubic feet you determined even with the
3 transient head would be leaking through the bottom of the
4 lagoon liner?

5 A Transient head scenario, the annual total was 602,343.5
6 cubic feet per year.

7 Q And, Dr. Lindsey, do you have an idea of what that would
8 be in gallons?

9 A Cubic feet, there are seven point whatever it is per
10 cubic foot.

11 Q Would you accept my representation, sir, that the
12 conversion rate is one cubic foot is equal to 7.48025
13 gallons?

14 A I would accept that.

15 Q Could you use the calculator I put up there to inform the
16 board how many millions of gallons that is.

17 A 7.48?

18 Q Sure.

19 A If I didn't -- if I hit the keys correctly, basically
20 4.5 million gallons.

21 Q And did you reach any opinions, sir, in this case about
22 whether that would be a leakage rate that is protective
23 of groundwater quality?

24 A I did not look at that, no.

25 Q And, in your experience as a hydrogeologist, do you

1 believe that to be protective of groundwater quality?

2 A I would look at how that mixes in an aquifer before I
3 reached that conclusion.

4 Q And what specifically would you look at?

5 A I'd look at the flux of that number, 4.5 million gallons,
6 intersect -- if it were to get to an aquifer,
7 intersecting that aquifer over some surface area of
8 effect, look at the hydraulic conductivity, groundwater
9 flow velocity of that aquifer, determine what that mixing
10 looks like over time because that's what you're basically
11 trying to do.

12 Q How would you, sir, understand what is going on in the
13 groundwater to come to that conclusion?

14 A With respect to water table? What do you mean?

15 Q Well, let's start with respect to existing water quality.

16 A If I had water quality data, then I'd know what that
17 existing water quality is.

18 Q Where would you expect to find -- how would you expect to
19 find that existing water quality data?

20 A If it's existing information, I could use that. If I had
21 a monitoring program, I could use that.

22 Q Is it fair to say, you'd need to have groundwater
23 monitoring wells to figure out what's going on in the
24 groundwater?

25 A Are you asking if I -- are you asking, to know what's in

1 groundwater, do I need a groundwater sample or a well?

2 Q Sure.

3 A Yeah. If you want to know what's in the groundwater, you
4 have to measure it.

5 Q And, Dr. Lindsey, in regards to this transient state
6 or -- excuse me -- the transient head -- I don't want to
7 confuse that with the steady state -- is there anything
8 you would change in the permit to address this?

9 A I didn't look at changing anything in the permit. I was
10 asked to comment on the hydrogeology that's behind some
11 of the permit topics.

12 Q Thank you, sir. One last area of questioning for you.

13 And I believe you testified -- correct me if I'm
14 wrong, please -- that there are situations where lagoons
15 will not leak through the liner, and I believe it was in
16 the context of the liner being unsaturated. Is that
17 accurate?

18 A Well, seepage through the liner will be driven by the
19 liner saturation, be driven by the head. If you change
20 those, if those change to the point where that driving
21 force is stopped, then it will stop moving through the
22 liner.

23 Also, depending on head -- actually, if you dry out
24 or empty a lagoon totally, you get upward movement
25 through a liner. The matrix potential will drag water

1 upwards just like the capillary effect of the glass.

2 Q For that to happen, a lagoon would have to have no head;
3 right?

4 A Lagoon would have to be empty, yes.

5 Q Okay. And is that also true for the movement through the
6 liner? The lagoon would have to be empty to achieve
7 that?

8 A To start --

9 Q To achieve no movement of water moisture through the
10 liner?

11 A You could run the calculations and determine that, yeah.
12 As the head decreases, the flux will -- movement will
13 decrease and will eventually stop.

14 Q Sir, you --

15 A Move head.

16 Q Sorry. Didn't mean to interrupt.

17 A That's all right.

18 Q You actually did that in your expert report, didn't you,
19 some calculations?

20 A Of?

21 Q I believe the wetting front and saturation versus
22 unsaturation; is that right?

23 A We did the green end calculations.

24 Q Yeah. Well, if you actually turn the next page, it might
25 be on the next page there, in your Section 4.5.

1 This is the section we're talking about?

2 A Okay.

3 Q Well, I believe that's the section. I want to make sure.

4 A Okay. Yeah. That's the section that talks about that
5 equation.

6 Q Okay. And I want to make sure I get this right. I
7 believe in this section you're opining that a dairy CAFO
8 could achieve unsaturated conditions in its lagoon liner
9 if it manages the lagoon in certain situations or in
10 certain ways. Is that fair?

11 A I'd have to reread it quickly if you --

12 Q Please do.

13 A Okay. I see that bolding where I think you've gotten
14 that.

15 Q Are we talking about the same thing, that's the right
16 spot?

17 A Page 13, top of the first full paragraph.

18 Q And I believe your opinions there were that, when the
19 lagoon liner is first installed, it's unsaturated; right?

20 A That's my understanding, yes.

21 Q And your opinions in this case are that unsaturated flow
22 is less than saturated flow?

23 A That's more than my opinion.

24 Q Sure. In regards to limiting the flow through a liner,
25 how would a CAFO that's in operation go about achieving

1 that?

2 A I don't operate a CAFO. I can offer an opinion off the
3 top of my head, but I don't run CAFOs.

4 Q You do work with CAFOs; right?

5 A I do.

6 Q And specifically regarding lagoons?

7 A Some, yes.

8 Q So along those lines, in your experience, how would a
9 CAFO operator go about managing their lagoons to achieve
10 an unsaturated lagoon condition -- excuse me -- an
11 unsaturated liner condition?

12 A If -- so you're asking me to solve a hypothetical? I
13 mean, I'm not --

14 Q It is discussed in your report right there, isn't it?

15 A I do say, if properly managed, there will be
16 circumstances when the liner never becomes fully
17 saturated. Is that what you're referring to?

18 Q I am, sir.

19 Could you please explain what are some of those
20 circumstances.

21 A Manage their head differently, manage your loading
22 differently.

23 Q And how exactly would a CAFO operator manage their head
24 differently?

25 A Additional capacity in the storage system, timing of

1 potential removal of -- basically you're removing your
2 fluid from the lagoon or dropping your fluid level into
3 the lagoon to manage that head driver through the liner.

4 Q But you have to dry out the liner to achieve an
5 unsaturated condition again?

6 A Achieve an unsaturated condition? If you drop the head,
7 possibly not, because if you still have flux through the
8 liner into the vadose zone, which would decrease the head
9 enough at the surface of the liner, you may actually have
10 a pressure discontinue in the -- where you're not pushing
11 it into the top of the liner faster than you're pulling
12 it out of the bottom of the liner.

13 Q What type of head do you think you'd have to have or how
14 many feet of lagoon material would you have to have to
15 achieve that?

16 A It would be a lower number than a full lagoon. I'd have
17 to -- I don't know.

18 Q It would have to be really close to empty, wouldn't it?

19 A I wouldn't speculate on that until I knew more about this
20 lagoon you're talking about.

21 Q Sir, is it fair to say in your expert report you do
22 speculate about that?

23 MS. NICHOLSON: Objection.

24 Argumentative.

25 JUDGE FRANCKS: I'm going to sustain

1 that.

2 Would you show --

3 Q (By Mr. Snyder) Let me put it this way, sir: We're
4 talking about this section right now. In particular, I
5 believe you opined that an unsaturated lagoon liner that
6 was installed would become fully saturated, depending on
7 some certain circumstances that you make in terms of head
8 and everything else in 5.6 days if the lagoon liner has a
9 permeability of ten to the negative six; is that right?

10 A I ran that calculation, yes.

11 Q So if a lagoon gets -- if the liner becomes saturated in
12 5.6 days, how would a CAFO operator go about getting it
13 unsaturated again?

14 A So that equation -- first off, I made a couple other
15 assumptions from that equation. I put in an immediate
16 426.7 centimeter -- I think it was about 14 and a half
17 feet -- put in an immediate steady state head on it, just
18 basically the purpose of demonstrating how the equation
19 works.

20 So the first assumption, a -- immediately loaded to
21 14 feet, run the equation, 5.6 days.

22 Q And I just want to stop you.

23 That's 5.6 days from unsaturated to saturated?

24 A For the moisture to fully penetrate that one 30.48 or
25 one-foot liner.

1 Q I was about to ask you how thick of a liner.

2 You're talking about one foot?

3 A Correct.

4 Q So then let's say we get to that.

5 A Mm-hm.

6 Q How does a CAFO operator go about achieving unsaturated
7 lagoon conditions, again, in that liner?

8 A It's back to the head -- driving head force in the
9 liner -- or in the lagoon itself.

10 Q And in your experience being around CAFOs, is there ever
11 a time where the manure generation from a CAFO is such
12 that they could do that, they could not have saturated
13 conditions in the liner?

14 A If they have other lagoon capacity elsewhere in their
15 system, sure.

16 Q Let's assume they don't. Let's assume they just have
17 this one lagoon.

18 A If they have one lagoon, they have one lagoon.

19 Q It would be really tough to do; right?

20 A It would be tough to do.

21 MR. SNYDER: That's all I have. Thank
22 you.

23 JUDGE FRANCKS: Any redirect?

24 MS. NICHOLSON: I do have a brief
25 redirect, Your Honor.

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REDIRECT EXAMINATION

BY MS. NICHOLSON:

Q Ms. Barney asked you about permit terms that would talk about Darcy and seepage and were you aware of any permit terms that invoked the use of Darcy.

And I wanted to ask you: Were you under the impression that the fundamental basis for the liner lagoon provisions required application of Darcy because those liners are in a -- the lagoons are located in a vadose zone? Was that your assumption?

A When we started this effort reading through the permit conditions and its reference back to the implementation guidance, I -- yeah.

I mean, I think it's referring to that loading equation in the implementation guidance, which is Darcy flow equation. And since we have a vadose zone beneath -- at least potentially commonly do have -- always do probably -- anyway, I don't want to -- we have a vadose zone below a liner. We have to start considering the unsaturated Darcy state on top of the saturated Darcy state.

Q Could I have you look at R-1, Section S4.B, and that's in the PDF on Page 13, and it's on your paper copy on Page 13 as well.

A Okay. Sorry. Which page again?

1 Q Page 13.

2 A I'm on Page 13, S4.

3 Q S4.B.

4 A Okay. I'm there.

5 Q And in that -- the last paragraph there where it talks
6 about lagoons and other liquid structures built,
7 expanded, or having major refurbishment, complete
8 emptying and re-compaction to restore earthen liner, done
9 after the issuance of this permit must achieve
10 permeability of one times ten to the minus six
11 centimeters without consideration for manure seal, and
12 there must be a minimum of two feet of vertical
13 separation between the bottom of the lagoon measured from
14 the outside of the earthen liner and the water table,
15 including the seasonal high water table.

16 Is this a permit -- a provision that you had in mind
17 regarding application of Darcy's law?

18 A Yeah, it is. Talking about permeability -- whenever I
19 talk about permeability, I start thinking about Darcy's
20 law.

21 Q Okay. So this is just another example of what -- when
22 you --

23 A Yeah.

24 MS. NICHOLSON: Okay. As a
25 housekeeping measure, I think I forgot to admit or move

1 to admit his expert report of just I-8.

2 JUDGE FRANCKS: Okay. I-8 is
3 admitted.

4 MR. SNYDER: Your Honor, our
5 objections to that would be only to the extent
6 Dr. Lindsey didn't opine about many of the issues that
7 are in that expert report.

8 So we agree the expert report can come in for the
9 issues he did opine on, but for other issues, our
10 objection --

11 MS. NICHOLSON: Your Honor, he wrote
12 the expert report for the issues in this case and the
13 issues are issues we brought before the board. He might
14 not have addressed all of them today, but there's no
15 reason to exclude any of his opinions. They were
16 presented to the parties prior to his deposition, and
17 they were able to question him on all of it.

18 JUDGE FRANCKS: Yeah. I-8 is admitted
19 for all of the content.

20 (Exhibit No. I-8 admitted.)

21 MR. SNYDER: Thank you, Your Honor.

22 JUDGE FRANCKS: So are you done with
23 redirect?

24 MS. NICHOLSON: I have one more
25 question.

1 JUDGE FRANCKS: Okay. Sorry. I was
2 confused by housekeeping.

3 MS. NICHOLSON: Yeah. I'm sorry. I
4 didn't want to forget that again so I have a little note
5 there.

6 Q (By Ms. Nicholson) I wanted to ask you, on Page 11 of
7 your expert report -- so this is back on I-8, and
8 Mr. Snyder was asking you some questions about the liner
9 saturation. Excuse me. It's Page 11. I think I might
10 have said the wrong page.

11 A Okay. I'm on Page 11.

12 Q The calculations that you made here, are they assuming
13 saturated conditions?

14 A Only with respect to a liner. They're not speculating
15 about -- not assuming that they're saturated conditions
16 in the vadose zone.

17 Q Right. But you're assuming saturated conditions in the
18 liner?

19 A For the purposes of those calculations, yes.

20 MS. NICHOLSON: Okay. I think I'm
21 done with questions, Your Honor. Thank you.

22 JUDGE FRANCKS: Okay. Board
23 questions?

24 MR. WISE: I did have a few.

25 JUDGE FRANCKS: Okay. Mr. Wise?

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EXAMINATION

BY MR. WISE:

Q Good afternoon, Dr. Lindsey.

A Good afternoon.

Q I'm looking at your expert report, Figure 1, the diagram of the vadose zone, which you probably have memorized, but if you want to go to it, I'll give you time.

A I'm there.

Q I'm looking at the perch zone, and I think you said that the vadose zone, by definition, is unsaturated, so I'm a little confused as to what a perch zone is.

Is that an area of saturated soil or --

A Sorry. The vadose zone is dominated by unsaturated flow conditions. It is predominantly unsaturated being defined by the bottom, the regional aquifer.

I didn't say it was totally unsaturated. You will get locally developed saturated conditions in a vadose zone under the right circumstances where, if there is moisture moving downward because you've exceeded field capacity, you would hit a low permeability layer.

And that water could potentially collect, if it does collect, and form a small locally saturated interval, but it's still encased within the overall vadose zone.

That's what the perched zone or perched water is.

Q Okay. If you had a large enough clay layer, would that

1 eventually have a gradient like the water table? Does --
2 is it going to move out of there at some point?

3 A They will, yes.

4 Q Okay. And now, what exactly is your definition of a
5 water table? I mean, how is that characterized?

6 A That's a great question. So when you look up water
7 table, it's commonly defined something to the effect of
8 the first saturated zone that covers a large or regional
9 area.

10 And it's -- it almost has definitions within
11 definitions, but for all practical purposes, it's that
12 zone of saturation below the subsurface that extends far
13 enough that everybody was assume -- would say, "That's
14 the water table in our area."

15 Usually it's miles, if not tens of miles, and
16 commonly it's a water resource of some kind. It doesn't
17 have to be. I've seen artificial saturated aquifer
18 systems as well. So it's bigger than these local perched
19 zones.

20 Q So if a perch zone is big enough, would that establish
21 another water table?

22 A Yeah, it would.

23 Q So you could have multiple water table levels?

24 A You do -- you can -- there are a number of hydraulic
25 systems throughout our region where you have multiple

1 water level zones or multiple aquifers stacked one on top
2 of another.

3 Q And an aquifer is -- by contrast, is more of a discrete
4 like an isolated sort of pool of water as opposed to a
5 saturated level of soil?

6 A No. Actually, hydrogeologists, we love to talk -- jump
7 back and forth between aquifer and water table.

8 Q Okay.

9 A And aquifer is a term that's -- defines -- or it's the
10 water-bearing system, the aquifer. All aquifers have a
11 water table, if they're unconfined.

12 If they're confined, we commonly call it a potential
13 geometric surface, so --

14 Q Okay. I guess I'm thinking of a confined aquifer.

15 A Yeah. There are confined aquifers, and most of our
16 discussions the past few days are generally referring to
17 unconfined or water table aquifers.

18 MR. WISE: Okay. Thank you. That's
19 very helpful.

20 THE WITNESS: Welcome.

21 JUDGE FRANCKS: Questions based on the
22 board questions?

23 No? Okay. Thank you.

24 THE WITNESS: Thank you.

25 JUDGE FRANCKS: You're excused.

1 Ms. Nicholson, do we have another witness?

2 MS. NICHOLSON: We do. We'd like to
3 call Dr. Shannon Neibergs.

4 JUDGE FRANCKS: The court reporter
5 will swear you in.

6

7 J. SHANNON NEIBERGS, PH.D., having been first duly sworn
8 by the Certified Court
9 Reporter, testified as
10 follows:

11

12 DIRECT EXAMINATION

13 BY MS. NICHOLSON:

14 Q Good afternoon, Dr. Neibergs.

15 A Good afternoon.

16 Q How are you doing today?

17 A Real good. Thank you.

18 Q I'm going to find your tab. Give me one second.

19 Could you please look at Exhibit I-9 in the book in
20 front of you.

21 A Yes.

22 Q And is that exhibit your resume?

23 A Yes, it is.

24 Q And could you give us a little bit of your professional
25 experience.

1 A My professional experience, I started my academic career
2 at the University of Louisville. I was an assistant and
3 associate professor in the equine business program in
4 their college of business.

5 And then in 2006, we were recruited back to
6 Washington State University where I'm an agricultural
7 economist in the Department of Economics at Washington
8 State University. And there, I'm an associate and now
9 full professor.

10 Q And can you tell me what nonacademic experience you may
11 have.

12 A Yeah. Prior to going to Texas to get my Ph.D., I worked
13 for the Farm Credit Banks as an internal credit reviewer.

14 And that position where I -- would have me travel
15 across the Pacific Northwest, looking at loan risk and
16 loans for the Farm Credit Banks, to evaluate loan
17 conditions, loan performance, performance of the bank,
18 and collecting failed loans or bad loans.

19 And that was my experience. It was in the farm
20 financial crisis, so it was a very stressful time of
21 financial risk in the industry.

22 Q And so when you were looking at that, is that a loan
23 portfolio then for a particular bank? Is that how it
24 works?

25 A Yes. Each bank, particularly with Farm Credit Banks,

1 their entire portfolio was agricultural loans, and so
2 when we went to the banks, we would look at a random
3 sample of those loans on their handling of good loans and
4 then a concentrated sampling of their handling of bad or
5 nonperforming loans.

6 Q And would you say that gave you some experience in
7 determining when a bank will make a loan decision?

8 A Yes. Through that, we were reviewing all their
9 performance reviews and evaluations and loan
10 documentation, underwriting standards, as they're called
11 in general banking terms.

12 MS. NICHOLSON: Okay. I'd like to
13 move to admit Exhibit I-9.

14 JUDGE FRANCKS: I-9 is admitted.

15 (Exhibit No. I-9 admitted.)

16 Q (By Ms. Nicholson) And I'd like you to turn to
17 Exhibit I-10.

18 And is I-10 the expert report you submitted in this
19 matter?

20 A Yes, it is.

21 Q And could you kind of give us an overall summary of your
22 opinion contained in your report.

23 A All this week we've been addressing AKART, the all known,
24 available, and reasonable methods to control, prevent,
25 and treat discharges.

1 And in that term "reasonable" I think it's really
2 important to consider the financial capacity and the
3 economics of the industry being in question, in this case
4 the dairy industry.

5 And so my expert report predominantly comments on
6 the financial capacity and performance of the dairy
7 industry over the past few years.

8 Q And could you give us an overview of the issues that the
9 dairy industries face.

10 A Well, one thing I think that's been reported and
11 available is that, in 2016 and 2015, the dairies lost
12 money on each cow they had in their inventory.

13 In 2015, it was \$30. In 2016, it was \$40. I'm a
14 little nervous. I can't remember if I got those in the
15 right order, but the point being is they lost money in
16 2015 and 2016, not even covering their costs.

17 And another point to recognize on that is that, as
18 economists, we have to wait for the delay of when
19 information is reported.

20 So even for 2017, the data that I used is not yet
21 available.

22 Q Okay. So can you tell us why you would consider -- let
23 me start there.

24 Would you consider this a down cycle for dairy --
25 the dairy business?

1 A Yes. Commonly it's referred to as a negative
2 profitability across the dairy industry, addressing
3 issues of nonprofitability and financial stress, and data
4 that's reported.

5 Q And is this an uncommonly long period to experience that
6 sort of downturn?

7 A It's very interesting. Not -- more interesting, not
8 directly in my expert report, but across the industry.

9 If you look at farm profitability cycles -- I do
10 this quite a bit in my outreach to farmers on developing
11 risk management plans -- is that there's typically long
12 periods of average to below average profitability
13 followed by a few periods of good profitability.

14 So when you look at managing risk, when you look at
15 your capital investment, you have to have a long-term
16 horizon to look at potentially being average to below
17 average profitability for several years.

18 Q So that's the situation we're in, is this sort of
19 downturn.

20 And what do you contribute that downturn to? Any
21 particular factors?

22 A Yeah. So if you look at the profit equation, the profit
23 equation is very simple, is revenue minus expenses.

24 And so on revenue for a dairy farm, it's going to be
25 milk price times their production. Dairies are very good

1 at being consistent in improving their milk production,
2 so their profitability variability is all tied with milk
3 price.

4 And milk price they have absolutely no control over,
5 and so they have to be price takers.

6 Q So can you explain that a little bit. How -- normally we
7 think of a business, you sell your product at a certain
8 price, and people want it enough, they will pay that
9 price for your product.

10 How is the dairy industry different?

11 A Yeah. So the dairy industry -- that industry is, and
12 agricultural broadly, because they produce a homogeneous
13 product, it's not differentiated.

14 Also it's produced by a large number of producers.
15 If you had a concentrated industry like a phosphorous
16 plant, for example -- phosphorous plant is a sole source
17 of that good. So they're going to look at their cost of
18 production.

19 And we can go into the economics of that, but
20 basically summarizing it down, they're looking at the
21 cost of production. They're going to evaluate that cost
22 of production.

23 Any environmental remediations is going to be
24 included in that cost of production, and then they're
25 going to price their product to recover that remediation

1 cost.

2 As opposed to dairies, dairies, unfortunately, to
3 look at it, they're all competing against each other.
4 All these dairies in Washington, they're competing
5 against their neighbors, and they're competing against
6 Idaho and California, competing in the world market.

7 And so they cannot pass that cost on. It's just not
8 available in the marketing system for dairies.

9 Q Well, could you explain who sets the dairy milk price?

10 A Okay. That's an interesting question to answer. It's
11 also a very complex question. So I'll try to boil it
12 down and say it simply.

13 So dairy products are organized into classes.
14 There's four classes. There's a fluid milk class.
15 There's a yogurt class, yogurt and ice cream. There's a
16 Class 3 that's cheese production, and there's a Class 4
17 that's butter and whole milk powder.

18 So if you look at those classes, the fluid milk
19 class is the highest price overall in the country, and
20 you move down in price across those different classes,
21 and then those different classes have different demand
22 characteristics for each of those components.

23 And in the Pacific Northwest, because of our export
24 markets in proximity to the Asian rim, we predominantly
25 market a higher percentage of our product as Class 4

1 milk, which is a lower price, little more sensitive to
2 international trade.

3 Q So to -- to sum up, if I'm summing up correctly, the
4 price of milk in this state is set by the lowest
5 profitability type of milk that we export, which is a
6 powder, and that's set by the international market, that
7 price?

8 A Yeah. I'm missing communicating a few details on that.

9 Q Okay.

10 A So let me build some on that.

11 So on those four classes, there's a proportion
12 that's sold in each of those classes. There's a
13 different value of each of those classes.

14 And so it's a way to average for the order that gets
15 passed back to the milk -- what's called a mailbox milk
16 price.

17 The mailbox milk price is the milk price the
18 producers receive, and the USDA reports that. The USDA
19 does their calculation and they get the data from the
20 marketing orders on the proportions marketed through each
21 class.

22 They blend that price. Sometimes you'll hear about
23 milk being a blended price. So it's a weighted average
24 price across all those classes to be fair to all the
25 dairy producers in the region that are contributing milk.

1 Because, if you can think about it, the milk gets
2 put into the milk truck, goes on its route, one, two,
3 three dairies are commingling their milk, and it goes
4 into the processing center and gets through the
5 distribution channel.

6 Q So an individual dairy farmer will never be able to get
7 his own price for his milk because they all contribute?
8 It's all seen as one big product basically?

9 A That's a very good way to look at it, very succinct in
10 looking at it. And the only exception would be a few
11 dairies are able to niche market and self-brand their
12 milk.

13 And so they try to extract a little bit of revenue,
14 but they have extra risk because they're branding it and
15 processing it on their own.

16 Q Okay. So what are the natural concerns or restraints
17 applied to dairy producers?

18 A Excuse me?

19 Q What other financial concerns or constraints apply to
20 dairy producers?

21 A Well, the financial constraints, the dairy producers are
22 going to be like any other business, agricultural or
23 nonagricultural, are going to be very concerned with
24 profits and use of debt.

25 And one of the things that dairy producers have to

1 address is their debts loads and trying to manage their
2 debt loads and procuring debt into the risk of debt.

3 Q Can I have you look at Page -- actually, can I have you
4 look at Page 6 of your expert report? And this is
5 Figure 5.

6 And you can't really see that terribly well.
7 Hopefully you can on your screens.

8 Can you explain what Figure 5 is?

9 A Yes. Figure 5 is a dot map of dairy locations in the
10 state. I developed this map, using the Washington
11 Department of Agriculture Web face -- Web map interface
12 to develop this map.

13 The small green dots are being lost in the
14 definition -- in the printout. They're a little bit
15 better, but the small green dots represent small dairies,
16 200 and less. There's 144 green dots on that map. Those
17 numbers are reported in the text on I think it would be
18 Page 5.

19 So 144 green dots, 122 yellow dots, which are
20 midsized between 200 and 700 head dairies, and the large
21 red dots are above 700 dairies.

22 And there's 106 red dots combining for 371 dairies
23 accounted for in this data set from Washington Department
24 of Agriculture.

25 Q And does that mean that the vast majority of dairies in

1 the state of Washington are of the size from small to
2 medium -- small or medium? Excuse me.

3 A Yeah. So 106. So out of the 371, that would be the
4 larger, 700.

5 And I would even -- those were the data that was
6 available through that website. 700 cows in the West is
7 not a particularly large dairy anymore.

8 Q Okay. So for these majority of smaller dairies in the
9 state of Washington who can't set their own milk price
10 and they are subject to whatever price they get, an
11 increase in expenses sounds like it could be a
12 significant restraint or problem for them.

13 MS. KINN: Objection, Your Honor.
14 Ms. Nicholson's question assumes that the small under 200
15 cows are covered by this permit, which is not true and,
16 in fact, not in evidence.

17 MS. NICHOLSON: Your Honor, what we're
18 trying to establish are costs to dairy farmers who are --
19 would be subject to this permit if they chose to apply
20 for the permit, and we're going to get to what those
21 problems are.

22 So if you indulge us, we'll explain why that -- why
23 the costs matter regarding this permit.

24 JUDGE FRANCKS: Okay. I'm going to
25 allow it.

1 A Okay. So you were asking about the importance of cost
2 management, so we pretty -- it's clear that they're price
3 takers and they have no control of their revenue.

4 Also, add on the revenue side, there is limited to
5 no -- I say "limited," but essentially there is no risk
6 management tools at their disposal to hedge their risk.

7 Oftentimes you hear about the futures market to
8 hedge risk, other government crop insurance programs to
9 hedge risk using crop insurance, but the dairy producers
10 have limited access and availability to use risk
11 management to control their revenue.

12 They do have a -- what's called a margin protection
13 program, which is a USDA farm built program to manage
14 risk, but that has proven to be ineffective, and so it's
15 not been used. It just hasn't been.

16 When they were losing money at \$40 a head and \$30
17 per head in 2015 and 2016, that should have triggered
18 those MPP payments for risk management, and it did not.

19 And so the tools on the revenue side do not exist
20 for dairies, and so they don't have that risk management.
21 So when they're looking at negative profitability, they
22 can't improve their revenue.

23 They have to look at cost management, and then
24 they're going to have to make trade-offs and sacrifices
25 to manage cost as best they can.

1 And typically they can't manage cost to appoint --
2 there's not enough management flexibility to turn a low
3 revenue year into profit by controlling cost because the
4 costs are inelastic.

5 You have to pay your labor to milk the cows. You
6 have to feed the cows. You have to pay for your tractors
7 and equipment.

8 So on the cost management side, there's not --
9 there's not much flexibility on that part either.

10 Q So do all these constraints make the dairy business a
11 little more vulnerable than most businesses to failure?

12 A Absolutely. It's a very high risk, high financial stress
13 industry. And even outside or in my work as the director
14 of the risk management center, talking about risk across
15 the western region and you talk to banks, their high risk
16 portfolio is dairy.

17 That's -- that -- you talk to them and agriculture
18 is fine. My risk is in the dairy portfolio.

19 Q And are you aware of any dairies going out of business in
20 this particular down cycle?

21 A The number of dairies have been on a decline -- historic
22 decline for consistently annually.

23 As you look at this data, the data used to be
24 reported annually. They stopped reporting it annually in
25 2007, but you look at the census data. You look at the

1 number of dairies providing milk into the order.

2 Those numbers, they're on a continual decline,
3 indicating that they're going out of business -- the
4 number of dairies are going out of business.

5 There are a few bankruptcies that are being reported
6 in the Capital Press, which is a popular press literature
7 on notoriety.

8 But mostly bankruptcies are not -- you don't want --
9 the bank doesn't want to report bankruptcy in the press.
10 The individual dairies don't want to report bankruptcy.

11 And when you're looking at that point, the prudent
12 thing to manage is to manage things so that they don't
13 reach bankruptcy, that you sell your dairy, you
14 liquidate. You try to do something different to protect
15 your equity of investment across that.

16 So to summarize my answer to your question is that
17 the number of dairies are failing. They continue to be
18 under financial pressure, and, so, yeah, their number is
19 declining.

20 MS. KINN: Your Honor, I'm going to
21 have to object on hearsay for any statements Mr. Neibergs
22 makes that are based on Capital Press articles.

23 Those are not independently researched by
24 Mr. Neibergs, and I ask that they be excluded from
25 evidence.

1 JUDGE FRANCKS: I think it's the kind
2 of hearsay that he can -- he can rely upon. I'll allow
3 that.

4 Q (By Ms. Nicholson) So in summarizing that, would you say
5 one of the reasons why you don't hear about bankruptcies
6 of some of these dairies, most of which are small to
7 medium, is because these are family businesses and they
8 don't talk about that?

9 A It's -- my experience with dairy producers and dairy
10 families is that they are -- they are very proud. They
11 are very family oriented.

12 They are very interested in maintaining a legacy of
13 their dairy over multiple generations, and having to
14 address financial failure is something that's very hard,
15 including the suicide risk from financial failure.

16 And it's been noted that dairy producers with
17 financial failure have a high rate of suicide risk.

18 Q Thank you.

19 Turning back to your expert report, did we ask you
20 to provide us with some soil sampling costs?

21 A Yes. Originally --

22 Q And I believe that's on Page 10 of I-10.

23 A Yes. Originally one of the issues when we did the expert
24 report was a comparison to the economic impact assessment
25 report on their cost.

1 And so soil sampling costs was an issue, and so I
2 went out and collected information and put this table
3 together on soil sampling costs.

4 Q So when I'm looking at your soil sampling costs -- and
5 I'm just looking under soil depth zero to 12 inches, and
6 then you have divided into east side and west side for
7 spring and fall, that price is \$32.

8 What does that include?

9 A \$32 only includes the compounds -- the compounds, I
10 think, are listed previously in Table 3 on what the
11 compound -- or was it Table 3?

12 Yeah. Table 3 has some data on what compounds are
13 tested, the nitrates and the ammonia, phosphorous, for
14 example. And so those -- that \$32 cost only includes
15 those lab fee costs.

16 Q That's lab fee only?

17 A Lab fee only.

18 Q So what other costs do you incur with a soil sample test?

19 A With a soil sampling test, you're going to have to
20 actually collect the data.

21 And if you look below that table, let me see if I
22 can point it out to the board. I don't know, one, two,
23 three, starting at the end of the fifth line, I'll read
24 it and hopefully you can follow it with me.

25 "A soil testing service cost is not included in the

1 above estimates but is likely to be an additional
2 expense."

3 So the \$32 just reflects the lab fee cost, which was
4 the way the economic impact assessment reported its soil
5 costs, so I wanted to be able to compare apples to
6 apples.

7 But if you're looking at the overall soil testing
8 cost, you're going to have to have a soil collection
9 testing service cost.

10 Q Okay. So this is a very conservative estimate of soil
11 sample cost --

12 A Very.

13 Q -- reflected in your --

14 A Yeah. I tried to be conservative on all the assumptions.

15 Q So I -- do you have information on what those soil
16 sampling -- obtaining a soil sample would cost?

17 A Yes. Mr. Haggith provided us some information and me
18 some information on -- that he does this type of work,
19 and those soil testing costs on the west side for the
20 zero to 12 inches would be between 20 and 50 dollars per
21 field sample.

22 And then on the east side, as you go from 12 -- the
23 first zero to 12 inches and the 12 to 24 inches would be
24 a fifty to eighty dollar cost because you have a deeper
25 depth.

1 And then if you have to go to the 25 to 36 inches
2 cost or the cost to get to that third depth level, that
3 could be as high as \$120.

4 Q For -- this is to obtain the sample?

5 A To obtain each field sample.

6 Q That's a per field basis?

7 A Per field.

8 Q Okay. Is -- can you let -- can you tell me, for soil
9 samples on the western side of the state -- and we're
10 just going to say the first foot.

11 So first foot soil sample, western side of the
12 state, using a total actual cost, including the cost to
13 obtain the sample, what would that be per dairy farm?

14 A Okay.

15 Q And what assumptions would you need to make to make that
16 calculation?

17 A Okay. So let's walk through. We have two or three
18 points that we need to address that estimate.

19 So we have the \$32 for the lab fee cost. I
20 mentioned that the cost estimate range to collect the
21 sample was between 20 and 50.

22 So if we use a conservative \$30, so we have \$30 plus
23 \$32, which would be \$62, to get the sample and send it to
24 the lab, that would be one cost.

25 But then we also have to multiply it. If you look

1 at the number of fields tested in Table 4, down -- I
2 don't know -- a few lines, the 12.7 fields.

3 Q Mm-hm.

4 A The 12.7 fields was the number of fields used by the
5 economic impact assessment as an estimate of the number
6 of fields on each of those farms.

7 Q Is that a pretty low estimate?

8 A It's a conservative estimate based on some other analysis
9 that it's -- it's conservative.

10 Q Okay. But using their estimate of -- was that 12.7? Is
11 that what you said?

12 A 12.7.

13 Q 12.7 fields per farm with the actual cost of \$62 --

14 A Yeah. And you multiply those two numbers out. It's \$787
15 and I think 40 cents.

16 Q Okay. So another 700, 800 dollars per farm for a spring
17 soil sample test?

18 A Correct.

19 Q Okay. Let's move to the east side, and tell me what the
20 cost per farm would be for a fall sample in the second
21 and third foot, so 12 to 24 inches and 25 to 36 inches.

22 A I didn't do that multiplication because I was thinking
23 that the third layer would be only under unique
24 circumstances where the field was identified as a
25 problem.

1 But the typical first two layers of zero to 12 and
2 12 to 24 with \$32 of a lab fee for each of those levels,
3 so you'd have \$64 in lab fees. You add another \$60 in a
4 typical field collection fee, and then using the same
5 number of fields, 12.7, that estimate would be \$1,575.

6 Q Okay. So per farm, we're talking about an \$800 expense
7 and a \$1,500 expense. That doesn't sound like much.

8 Is that going to have a big impact?

9 A I would say, on the fiscal side or on the financial
10 capacity side, the dairies would be able to absorb that
11 cost as an operating cost. It's not a large cost to
12 restrict their financial capacity.

13 Q Okay. What about groundwater monitoring wells? You've
14 heard some testimony this week about what those might
15 cost.

16 And what did you hear this week?

17 A Okay. So the groundwater monitoring wells we've heard
18 Mr. Erickson make costs -- or make cost estimates of
19 about \$5,000 per monitoring well, with a minimum of three
20 wells per site to look at.

21 Mr. Erickson also mentioned up to eight for a site,
22 and then -- and then if you look at the application
23 field, that would be --

24 MS. KINN: Objection, Your Honor.

25 Mr. Neibergs is testifying to information and facts that

1 are in his expert report.

2 JUDGE FRANCKS: I think he's trying to
3 respond to your expert, so --

4 MS. KINN: He's not identified as a
5 rebuttal witness, however.

6 MS. NICHOLSON: All witnesses are
7 rebuttal witnesses. We've reserved that right.

8 JUDGE FRANCKS: I think this testimony
9 is allowed.

10 A So those monitoring cost estimates are -- have been
11 consistent, consistent from Mr. Erickson's testimony.
12 They're consistent with Mr. Lindsey's experience on
13 groundwater monitoring.

14 So that about \$5,000 cost per well -- monitoring
15 well with more cost if you have to go deeper, of course,
16 and it was deeper, so at a minimum of \$15,000 per site,
17 moving up higher.

18 Q (By Ms. Nicholson) So at a very, very conservative
19 estimate, assuming you only have one site to monitor on
20 your farm, that's at the minimum \$15,000?

21 A Minimum.

22 Q Now, how does an expense like \$15,000 affect a dairy
23 business with zero margin that you've been describing?

24 A Yeah. Not only zero but negative margin. It's a
25 significant -- it becomes significant, and it means that

1 they have to either borrow money through their operating
2 line or pay for it somehow through reserves or take on
3 additional debt to cover those expenses.

4 Q And if they don't have a line of credit available to
5 them, then what kind of hard choices do they need to make
6 about their business?

7 A Well, if they no longer have a line of credit to get it,
8 it's a matter of cash flow. It's a matter of your
9 personal cash flow as well.

10 If you don't have enough cash -- and really I was
11 thinking about this. Well, I'll just continue along my
12 thought.

13 It's cash flow management, and if you don't have
14 cash, you're not able to borrow against more of your
15 equity or operating line, that's going to be the point
16 where failure has occurred and ramifications of that
17 failure will pursue -- or be pursuant to that.

18 Q So it would be a situation where maybe they have to buy
19 lower quality feed or maybe they have to sell some of
20 their cows and downsize the business, something of that
21 nature?

22 A Yeah. They -- selling cows might work, but the cows are
23 probably secured, so they wouldn't --

24 MS. KINN: Objection, Your Honor.

25 This is speculative. Mr. Neibergs hasn't presented any

1 fact to suggest that he would have firsthand knowledge of
2 any of this.

3 MS. NICHOLSON: I believe he did, Your
4 Honor. I mean, he's talked about knowing about the loan
5 industry and credit, and he works exclusively in this
6 area as an economic expert for dairy industry.

7 JUDGE FRANCK: I think it's
8 allowable.

9 A Yeah. So we're talking about having negative cash flow
10 and ramifications of negative cash flow.

11 I think we can just go across the audience. As you
12 are developing your youth and the cash was tight,
13 negative cash flow is a very serious concern commonly
14 across everybody.

15 And when you're running a business like a dairy, you
16 have negative cash flow, and you mentioned, "Well, I'm
17 going to not feed them as well," that's a negative -- I
18 would not suggest that they do that because it's going to
19 be a negative deal.

20 You're going to decrease your feed -- you're feeding
21 an engine. You're feeding a productive asset. You
22 decrease the quality of gasoline going into that engine
23 or whatever, it's going to gum up the work, maybe create
24 health issues.

25 So they really don't have the capacity to, all of a

1 sudden, buy cheaper feed into the production chain.
2 That's not really a good management option for them to
3 take.

4 Do more labor themselves maybe if they can -- if
5 they're not fully committed on labor. Profits -- and
6 probably the first point of sacrifice is going to be
7 their family living expenses.

8 They're going to -- the money flows into the dairy.
9 They pay their labor, and the profits and the net returns
10 go to the family for profitability and family living
11 expenses.

12 That's going to be -- they're going to tighten the
13 belt there first and then go into trying to maybe manage
14 labor, ask people to work harder for the same amount of
15 money.

16 It's just a negative cycle, as you can imagine, cash
17 flow problems. People that you know or you've
18 experienced yourself, you get into that bind and then
19 things start really falling down rapidly.

20 If they're actually in a cash flow deficit and
21 they're getting to that point and they have payables,
22 they're getting accruing penalties, their cost of
23 obtaining capital -- this is certainly a point that
24 they're going to be valued at high risk.

25 They're going to have to pay a higher interest rate,

1 so they're going to have a higher interest cost to secure
2 capital secure lending. And it's just a negative cycle
3 all around, and you could paint a negative picture
4 through that.

5 Q (By Ms. Nicholson) Okay. There's one last area I want
6 to kind of address on economic cost basis. So you've
7 heard some testimony. You've been here all week; is that
8 correct?

9 A That's correct.

10 Q And so you've heard testimony by Bill Reck and by Ecology
11 and the -- about the difference between the bottom of the
12 liner.

13 And is it your understanding that there is a
14 difference in that definition? So Ecology thinks it's
15 here and NRCS thinks it's here, and that difference is
16 whatever the thickness of the liner is the difference of
17 opinion on the bottom of the lagoon, what that means.

18 Do you agree with that in a very simplistic way?

19 A In a simplistic way, the cost of the lagoons and bringing
20 the lagoons up to speed and standards, meeting permit
21 standards is a very significant cost and --

22 Q And can you address that cost? And I believe it's
23 addressed in your report as well, but can you address the
24 cost of a manure lagoon retrofit?

25 A Yeah. On Page 10, collaborating with Dr. Joe Harrison,

1 there is some information on lagoon, prefitting costs.
2 There's another reference to lagoon waste management on
3 that Liu and Shumway report. That's a reference on a
4 footnote on Page 11.

5 And so those costs are expensive and really just --

6 Q Can you give us any actual numbers? And these are
7 estimates, I realize, but any actual number you heard
8 during testimony this week or from Dr. Harrison?

9 A Yeah. And as we heard Mr. Erickson, who is clearly an
10 expert in developing lagoons, quote really dramatic
11 prices on those lagoon retrofitting and construction
12 costs, he gave one example where it was \$200,000 for the
13 lagoon reconstruction installation, plus \$200,000 for the
14 lagoon liner cost.

15 He gave a second example after that of a bigger
16 lagoon, which was a \$300,000 construction and fitting
17 cost and a \$300,000 liner cost.

18 And he gave us a third example of a third lagoon
19 that they're budgeted to do, and he noticed some cost
20 savings on his cost example of \$220,000 for the liner and
21 probably matched to the construction costs relative to
22 his previous examples.

23 So the point being, those three costs are hundreds
24 of thousands of dollars up to half a million dollars,
25 close to.

1 We have examples from Dr. Harrison's analysis that's
2 referenced in the report of up to \$500,000 for lagoon
3 liner costs.

4 And in the footnote references their hundreds of
5 thousands of dollars of cost for the lagoon system just
6 to NRCS standards as their design characteristics.

7 Q Okay. So now we're talking in the hundreds of thousands
8 of dollars of cost to an industry that's running with
9 zero margin.

10 What would be the effect of that type of unexpected
11 expense to a producer?

12 A It's -- you can put yourself in their shoes. Look in
13 that type of capital investment cost, and in thinking
14 about that over this week, it's really -- it's a very
15 significant and serious issue that has to be addressed,
16 in that they have to make a decision on these type of
17 capital investment costs, and let's go through the
18 decisions and let's go through a couple financing
19 questions to kind of develop this issue.

20 First, on just dealing with uncertainty, if you
21 listen to the popular press on the economy in general and
22 businesses in general and Wall Street and international
23 trade, is that businesses very much do not like
24 uncertainty.

25 They don't like uncertainty of making these capital

1 investments and then still not meeting litigation risks,
2 and so that's going to hold them back from jumping in.

3 If we do these hundreds of thousands of dollars of
4 investment, we're going to be protected under the permit
5 against -- and there's uncertainty surrounding that
6 issue.

7 And with that uncertainty, they are not -- they're
8 not going to be excited about, "Okay. This is \$100,000
9 that protects me fully."

10 Then you have to consider, well, how are they going
11 to manage obtaining capital for potentially up to a
12 hundred to 500 -- well, we've heard examples of two,
13 three, five hundred thousand dollars for these lagoon
14 costs.

15 That's not the only cost. We talked -- we've heard
16 many references that the dairies are going to have
17 multiple lagoons. So it's not only one lagoon, but
18 probably at least two and maybe multiple beyond that.

19 And then so you have to multiply and make that
20 financial plan out to make that significant capital
21 investment, and then you're going to have to go and look
22 at your banker and your financial capacity to expand that
23 debt load and service that debt load.

24 And when looking at a bank, being a little jokingly,
25 I'd hate to be the loan officer that has to collect on a

1 manure lagoon, has to repossess a manure lagoon. That
2 was my weak attempt at humor. I'm sorry about that.

3 But the point about that is that they're making
4 these hundreds of thousands of dollars of investment into
5 their operation, but it doesn't improve their productive
6 capacity, and it doesn't improve the value of their farm,
7 meaning that, when you -- if you're an appraiser, if
8 you're looking at selling your farm, you're looking at
9 buying a farm, the dairy is a very specialized asset.

10 It's highest and best use is being a dairy farm.
11 And having a functional to the -- a functional lagoon
12 manure management system that meets permit requirements
13 that meets the regulatory requirements, that's an
14 absolute standard, if you're a buyer or seller and you're
15 going to have to remediate that or you're going to lose
16 equity value from that if it doesn't meet those
17 standards.

18 Q And, again, they can't really run out and get a loan for
19 this; correct?

20 A Correct.

21 Q And most of the dairies that you are aware of -- and you
22 talked to quite a few dairy operators on a frequent
23 basis; is that correct?

24 A We do extension programs where we go out and do workshops
25 with dairies and all across, yeah, so we do talk to

1 dairies.

2 Q And do they have a half a million dollars, \$200,000 to a
3 half a million dollars available to them?

4 A Not based on their comments, not based on their actions.

5 Q Would you -- in your opinion, would you expect that type
6 of expense, the up to half a million dollars for one
7 lagoon when there's probably multiple per farm, would you
8 expect that expense to put more dairy producers out of
9 business?

10 A Yes. And just to continue along along that, they're
11 going to have to look at it. I mentioned that these
12 dairy farmers are very family focused. They're very
13 interested in having a multi-generation legacy on that
14 dairy.

15 And they're going to have to look at their
16 individual situation and go, "Are we going to throw in
17 the towel? Are we going to" -- throwing in the towel
18 meaning that, "Okay. We can't make this dairy work for
19 our family anymore and our best alternative is to sell
20 the dairy."

21 And that's going to be a very emotional heartbreak
22 for that family as they have to make that adjustment.

23 MS. NICHOLSON: Okay. Thank you.

24 JUDGE FRANCKS: Let's take a
25 ten-minute break at this point and then we'll --

1 MS. NICHOLSON: Oh --

2 JUDGE FRANCKS: -- get --

3 MS. NICHOLSON: -- can I move to admit
4 his expert report, I-10, before I forget?

5 JUDGE FRANCKS: You may. I-10 is
6 admitted.

7 (Exhibit No. I-10 admitted.)

8 JUDGE FRANCKS: So come back at 2:35.

9 (Recess taken from 2:25 p.m. to
10 2:37 p.m.)

11 JUDGE FRANCKS: Have a seat. Let's go
12 back on the record after a break.

13 So, Ms. Barney, is it now your turn?

14 MS. BARNEY: It is, Your Honor. Thank
15 you.

16 JUDGE FRANCKS: Okay.

17 CROSS-EXAMINATION

18 BY MS. BARNEY:

19 Q Dr. Neibergs, I just have a couple questions on your
20 report, if we can look at Page 10 of your report.

21 A Yes.

22 Q Under the heading of "Lagoon Inspection and Repair," your
23 first sentence is, "The lagoon inspection and assessment
24 cost is a relatively small and one-time cost."

25 Is that -- what is that sentence related to?

1 A The initial inspection to look to see -- to inspect the
2 lagoon, if it's meeting the permit requirements, would be
3 the first time inspection cost.

4 And that may be relatively low cost, based on
5 discussing that with some people on what was done at the
6 inspections. Typically they told me it was a visual
7 inspection.

8 Q Mm-hm.

9 A And so then it's just going out and doing that visual
10 inspection. So that, in itself, was probably not that
11 large a cost, and that's what led to that sentence.

12 Q So was that the Tech Note 23 that we've been speaking of,
13 that assessment, based on that document?

14 A That's what I -- yes.

15 Q Okay. Thank you.

16 And then you go on to say, "Lagoon repair and liner
17 installation costs will be specific to" -- basically
18 specific to the dairy, the size, location, and on-site
19 factors; correct?

20 A Correct.

21 Q Okay. Thank you.

22 And I believe, just before we broke, I heard you say
23 that having a lagoon that does meet permit and regulatory
24 standards would be a benefit to a dairy.

25 Is that -- did I hear your testimony correctly?

1 A Benefit in terms of looking at the appraised value,
2 considering the appraised value of a dairy and what
3 components are needed within the dairy, that somebody
4 evaluating purchasing that dairy, so to speak, that would
5 certainly be a factor that they would consider if they
6 needed to -- just like if you inspected a house and there
7 was some problems, you have to remediate those problems
8 prior to selling your house.

9 I would imagine that, in selling a dairy or
10 purchasing a dairy, there's going to be inspection,
11 potentially negotiations on the state of the manure
12 management system or the lagoons.

13 MS. BARNEY: Great. Thank you very
14 much. That's all I have.

15 THE WITNESS: Thank you.

16 JUDGE FRANCKS: Ms. Kinn, is it you
17 who gets to question?

18 MS. KINN: Yes.

19 CROSS-EXAMINATION

20 BY MS. KINN:

21 Q Hello, Mr. Neibergs. We've met. Nice to see you again.

22 A Likewise.

23 Q I'm Katelyn Kinn for Puget Soundkeeper.

24 You confirmed with Ms. Williamson [sic] that you
25 were here all week; right?

1 A Yes. I was here all week, a little bit late on Monday,
2 but -- a little bit late on Monday because I flew over
3 from Pullman, but here all the week.

4 Q Okay. And you are an employee of Washington State
5 University; isn't that right?

6 A Yes.

7 Q Okay. And Washington State University is a publicly
8 funded education institution?

9 A Yes.

10 Q So isn't it true that you're not being paid for your time
11 here this week by the dairy industry?

12 A That is correct. I am receiving no compensation or even
13 travel expense support to be here, although I'm using
14 my -- we have -- we develop operation moneys to execute
15 our work that we develop through grant funds.

16 And we go through the accounting specifically, but
17 I'm using those operation funds as an application of my
18 workload assignment. So just to be perfectly clear on
19 that.

20 Q So it's the public university that's compensating you for
21 your time this entire week?

22 A Yes. I'm not -- I'm not taking vacation time. I've told
23 my supervisors that I was participating in this activity,
24 and they said fine. They didn't tell me to take personal
25 time.

1 Q And they've compensated your entire appearance in this
2 case?

3 A Paid my salary, my normal ongoing salary, yes.

4 Q And in recent years, maybe over the last five years,
5 you've received some grants from the Washington Dairy
6 Federation; isn't that right?

7 A That is correct. I've done some studies with the dairy
8 federation on economic impact analysis contribution, is
9 what the economist prefer to call it, but economic impact
10 studies, so yeah, at least two.

11 Q Do those studies identify how they were funded?

12 A They should. And if they weren't, that would be -- that
13 would be wrong, but they were funded by the dairy
14 federation.

15 Q Did you use any of those studies to inform the figures in
16 your expert report?

17 A I commented -- I included one paragraph, looking at the
18 overall economic contribution of the dairy industry to
19 the state.

20 Q And for that figure, you used research that was funded by
21 the dairy federation?

22 A Yeah. In the expert report, we could be a little more
23 specific and refer to the text because I don't think I
24 used a figure.

25 I thought I used just a descriptive text. Let's see

1 if I can find it. There it is. Sorry.

2 Q What page are you on?

3 A I'm on Exhibit 1-D, Page 5 of 12. It's Page 5 of my
4 expert report.

5 Q Is this the 5.2 billion figure?

6 A The 5.2 billion figure. So that's a paragraph
7 summarizing what the dairy contributes in terms of
8 economic contribution and employment to the state,
9 including dairy farms and dairy processing to the
10 wholesale level.

11 Q Okay. Thanks. I'll be asking you some more about that
12 in a little bit.

13 A Okay.

14 Q But for now I want to go to what you were just testifying
15 to in terms of the potential costs --

16 A Okay.

17 Q -- of this new permit.

18 A Okay.

19 Q So turning to Page -- let's see -- Page 7 of your expert
20 report, that second paragraph under "Economic Costs of
21 the New CAFO Permit," would you please read that for us.

22 A "The cost of implementing," starting with that?

23 Q Yes, please.

24 A Okay. "The cost of implementing and executing operations
25 to meet the new CAFO permit requirements will be unique

1 to each dairy.

2 "Each of the permit requirements for manure and
3 wastewater testing, soil testing, nutrient application
4 restrictions, and lagoon repairs, if needed, are site and
5 facility dependent."

6 Q Do you agree with that statement?

7 A I would agree with that statement just -- I agree with
8 that statement.

9 Q Are you aware that only some of the dairy operations in
10 Washington State are covered by this permit?

11 A Only some are covered, but --

12 Q Okay.

13 A Yeah.

14 Q Is it your understanding that each dairy operation is run
15 independently as a business with its own financial
16 circumstances and documents?

17 A I would say that, yes. I think that's a little bit more
18 complex than what might first appear. Each dairy might
19 have -- one dairy owner might have multiple dairies.

20 Q Okay.

21 A And so there might be some organizational structure that
22 complicates that, but, in general, they're individually
23 owned and operated and have a unique footprint --

24 Q Okay.

25 A -- so to speak.

1 Q Do you own or operate a dairy operation?

2 A I do not.

3 Q Did you review any financial data specific to any dairy
4 operations that are covered by this permit to inform your
5 conclusions in your report?

6 A That data doesn't exist, as far as individual -- the data
7 doesn't exist for me to review, and so that was not a
8 potential avenue of investigation.

9 Q Did you ask for any of these documents?

10 A No. Because the -- and let's -- let's maybe take a step
11 back as to why not.

12 Q That's okay. I think "no" is a --

13 MS. NICHOLSON: Objection, Your Honor.
14 If he would be allowed to answer the question.

15 JUDGE FRANCKS: He hadn't finished
16 answering, so let him answer.

17 A That's a very difficult avenue of information to get,
18 particularly for dairies. Dairymen are very close --
19 they do not like to share their financial information
20 whatsoever.

21 So going out and asking, "I want to get and look at
22 your financial statements to do this analysis," they
23 would tell me no. They have no obligation to share their
24 personal information.

25 And as you work with agricultural producers,

1 dairymen, cattlemen, getting -- procuring those inventory
2 levels, they don't even like to tell you inventory
3 levels.

4 If you know the industry, they don't want to have a
5 premise ID on the cattlemen side. There's just a lot of
6 personal -- from their perspective, they don't share that
7 information.

8 So I didn't have the time to ask, but I would
9 have -- I wouldn't have been successful in that effort,
10 even if I went down that avenue.

11 Q (By Ms. Kinn) So even though you acknowledge that each
12 operation has unique circumstances, you didn't review any
13 profit or loss data for any individual facility for your
14 calculations?

15 A Not that -- not that was available.

16 Q Okay. Have you ever reviewed financial documents for a
17 specific dairy in Washington State?

18 A In Washington State, there's been a few, and across the
19 country, there's been a few.

20 Q But none that were covered by this permit; right?

21 A None that were covered by this permit.

22 Q Turning to Page 3 of your report, just real briefly, can
23 you read the last sentence. Let's see.

24 A On Page 3?

25 Q Yeah. Sorry. One moment.

1 A Okay.

2 Q Okay. So if I understand this section, this first
3 paragraph, you were talking about the financial capacity
4 to make debt payments by families who own dairy
5 operations; isn't that right?

6 A That generally summarizes that.

7 Q Okay. Did you talk to any families in Washington who own
8 dairy operations to form that?

9 A I have through workshops talking about that in general,
10 not as work -- as following up on workshops that I did
11 over in Mount Vernon, again, in Sunnyside area, talking
12 about just general conversations about profitability
13 figures they shared.

14 Q Were these facilities covered by the permit?

15 A Not that I know of.

16 Q Did you cite any of that in your expert report?

17 A Not directly.

18 Q Have you read the permit that brings us here this week?

19 A I have read it. Certainly not -- I don't have it
20 memorized, but read the general permit.

21 Q Is it your understanding that dairy operations with less
22 than 200 cows are not categorically required to obtain
23 coverage?

24 A Yeah. I think, but -- I think that's an interesting
25 question.

1 Q Okay. Maybe we can get more into it in a moment.

2 A Okay. Sure.

3 MS. NICHOLSON: Objection. Can he
4 finish his answer?

5 MS. KINN: I think he did.

6 JUDGE FRANCKS: Well, you said you
7 were going to get to it in a minute, so I'm going to hold
8 you to that.

9 MS. KINN: Thank you.

10 Q (By Ms. Kinn) Okay. Can you turn to Page 11 of your
11 report. Can you read the last sentence in that first
12 paragraph.

13 A The one that, "It's entirely possible that the lagoon
14 requirement in the capital permit will force dairies out
15 of business"? Page 11?

16 Q Sorry.

17 A Okay.

18 Q So in preparing this report, did you speak to any small
19 dairy operations?

20 A Just -- not in an interview sense to collect data.

21 Q Right. Please turn to Page 11 -- I mean 12.

22 A Okay.

23 Q So this paragraph, please read the last sentence,
24 starting with, "To avoid."

25 A Okay. Last sentence of the first paragraph. Yes.

1 "To avoid being classified as a significant
2 contributor, much of the operating practices considering
3 lagoon management and edge of field management required
4 on the new permit will be considered for implementation
5 on small farms to reduce the risk of being classified as
6 a significant contributor of pollutants."

7 Q So having not talked about this with any of the small
8 dairy operations in this state, you aren't personally
9 aware that any small dairies are considering this, are
10 you?

11 A Well, I think, if you look at the map that was brought up
12 in the direct testimony of the location of the overlap
13 small dairies, particularly in Whatcom County, in that
14 part of the state, there's a number of neighboring small,
15 medium sized dairies.

16 And my thought on writing that statement would be is
17 that they're going to be risk adverse. They are not
18 going to want to be subject to any environmental lawsuits
19 or confrontation, that they are going to consider what
20 best management practices are being recommended or
21 required for the permit.

22 And they're going to evaluate whether that's
23 appropriate for their farm as well because they -- even
24 though they're 200 and less, they still are sustainably
25 conscious and want to be good operators of their dairies

1 and operate in the system and be good neighbors.

2 And I just think that as this technology and best
3 management practices get recommended and get implemented
4 through the industry, that they will also consider
5 adopting some of those practices as well.

6 But, no, I did not interview anybody -- any small
7 dairy that told me, "Oh, I'm going to jump in."

8 Q So this is just your professional opinion?

9 A That's correct.

10 Q Based on their locations essentially?

11 A That is correct, yeah.

12 Q Please turn to Page 4. You mentioned -- you discussed a
13 little bit about nutrient management and additional
14 costs.

15 That last sentence on Page 4 that leads into the top
16 of Page 5, would you please read that.

17 A "Additional nutrient management costs will put Washington
18 dairies at further competitive disadvantages and could
19 force dairies out of business."

20 Q Do you stand by that statement?

21 A Yeah. I think that's a definite conclusion, is you look
22 at -- there's a number -- and this is a contra-argument.

23 There's a number of studies that look at
24 environmental regulations, citing operations in areas
25 with more lax environmental regulations.

1 They looked at -- particularly for dairies, they
2 looked at why certain dairy regional dairy clusters
3 developed in areas -- I'll just name them. New Mexico
4 was one that got researched and South Dakota is another
5 one that's emerging -- that had been stereotyped as
6 having lower environmental regulations.

7 And so that expansion of those dairies relative to
8 lower environmental regulations was cited as a reason in
9 those studies that those dairies expanded -- the number
10 of dairy cows expanded in that area.

11 And so this would be a contra-argument, that if we
12 increase the regulatory requirements and increase those
13 costs, it could be a cost competitive disadvantage.

14 Q But, again, this opinion is not informed by any firsthand
15 knowledge you have on the ground with any particular
16 operations; right?

17 A That's correct.

18 Q I believe that you mentioned just a moment ago that
19 investments and technologies like manure lagoons may not
20 improve the value of a dairy operation.

21 Did I hear that right? Do you recall the deposition
22 that we did earlier this year?

23 A I recall, yes.

24 Q And do you recall that we discussed some of the impacts
25 on property value associated with operations like this?

1 A You'll have to -- I don't recall specifically, but
2 definitely I'm sure that we did in the deposition as
3 you're bringing it up.

4 Q Based on what you have heard this week, do you think
5 there are scenarios where an earthen manure lagoon may
6 leak or seep and cause damage to the value of a piece of
7 property ranging from soil to groundwater contamination?

8 MS. NICHOLSON: Objection, Your Honor.
9 Foundation for this witness. He's here to talk about
10 economics.

11 MS. KINN: In his direct --

12 JUDGE FRANCKS: You could ask some
13 foundation questions.

14 MS. KINN: Okay.

15 Q (By Ms. Kinn) You said you've been here all week; right?

16 A Correct.

17 Q So you've heard other witnesses testify to details about
18 the permit, and you've enhanced your professional
19 opinions based on them?

20 A Correct.

21 Q You testified during your direct exam on some new and
22 enhanced opinions based on what you've heard here this
23 morning?

24 A Correct. Yeah. Certainly.

25 Q So based on what you've heard here this week, do you

1 think there are scenarios where earthen manure lagoons
2 may leak or seep and cause damage to the value of a piece
3 of property ranging from soil to groundwater
4 contamination?

5 MS. NICHOLSON: Same objections, Your
6 Honor.

7 JUDGE FRANCKS: I'm going to allow it.

8 A I'm not at all an expert on hydrology or the ongoing
9 debate on the amount of seepage and what happens, but
10 those -- it would -- if there is a problem, that's
11 certainly going to affect value. You know what I mean?

12 To say otherwise would be -- just wouldn't be
13 truthful. I mean, you got to admit, but you also have to
14 qualify that "if" and how pervasive and the number of
15 other factors that are site specific.

16 And so I'll leave it at that.

17 Q (By Ms. Kinn) Thank you. You testified about the losses
18 incurred per cow for dairy operations in the Pacific
19 Northwest in 2015 and 2016; right?

20 A Mm-hm.

21 Q Can you please recall those figures for us?

22 A I think that most consistent ones were the loss of \$40
23 and \$30 as presented in Figure 3.

24 Q Where do you garner those figures?

25 A They're garnered from the source that's cited that Frazer

1 LLP Dairy Farm Operating Trends, which is an accounting
2 firm that that does a tremendous service to the industry
3 across the West, as you can see, all the regions and
4 states reported that would report this information that
5 would be available.

6 And no other -- no other publication at all because,
7 as I mentioned, the dairy financials are very -- they're
8 very conservative with sharing those, but these
9 accountants are able to put their portfolio of work
10 together and make this information available, which is of
11 high value.

12 Q Do you review all of those reports as they're issued?

13 A As I can. I don't get to only track dairy operations in
14 my workload, so it really -- I only get to review them as
15 the need arises to evaluate those -- those as they're
16 available.

17 Q Are you aware of any more recent profit numbers that may
18 have been released in 2017?

19 A They released their first six months of 2017, but they
20 have not yet released the June -- the second half yet.

21 Q Do you recall what the profit per animal was in the first
22 half of 2017?

23 A I believe -- you may have it in front of you. I'm
24 thinking it was a gain of \$95.

25 Q That's a substantial gain from 2015 to 2016, isn't it?

1 A When you're losing money to a gain, yes, it is. But I
2 would be cautioned on thinking that -- we don't know.

3 I would expect the \$95 to come down a little bit
4 over the whole year, but we haven't seen those figures.
5 In fact, I looked at this this morning, thinking that you
6 might bring that up. Still not released, so we don't
7 know.

8 But that variability is important and for -- and
9 you're correct in the first six months of that report,
10 that had gone up.

11 Q And you were surprised by that increase, weren't you?

12 A I was surprised by that increase. And I was surprised by
13 that increase because all the milk price -- I do get to
14 look at different monthly, weekly reports that are
15 reporting milk price.

16 And the milk price wasn't really being that strong,
17 but -- so, yeah, I was a little surprised based on the
18 news reports and other things that I was looking at as it
19 comes across my desk that it was that strong.

20 Q Turning to Page 3 of your expert report, Figure 3 on the
21 net income per milking cow per year, this figure includes
22 operations that have less than 200 cows; isn't that
23 right?

24 A That, I'm not sure of because I don't know if -- I don't
25 know if the underlying data -- if they've ever reported

1 the distribution of herd size relative to those numbers.

2 Q Do you know that they're separated out?

3 A Do I know that they are?

4 Q Yes.

5 A I do not know that they are.

6 Q And then quickly turning to Page 8, you discussed the
7 cost of lab tests?

8 A Yes.

9 Q Did you conduct research to inform your conclusions in
10 this section?

11 A What I did was an internet search of the available labs,
12 which are referenced on those hyperlinks in the report.
13 On trying to obtain that, made some calls, talking to
14 those people on the lab tests both for the manure sample
15 and the soil samples on trying to get that.

16 Q Did you get any information from operations that have
17 actually had these tests conducted?

18 A No.

19 Q And then turning to Page 5, here we are returning to your
20 \$5.2 billion figure.

21 A Okay.

22 Q What is this figure to you?

23 A The 5.2 billion?

24 Q Yes.

25 A Okay. So the total 5.2 billion economic contribution is

1 the aggregate direct and indirect economic contribution
2 of the dairy industry to the state.

3 So it includes that direct milk sales and production
4 to the dairy farms, plus the wholesale milk sales out of
5 the processors as they market that milk. And then that's
6 the direct.

7 And then the indirect aspect of that is that
8 employees that work for those firms, they go out in the
9 community. They're spending money on insurance. They're
10 spending money on clothes.

11 They're spending their money on local businesses
12 that further multiplies -- that's what they call it.
13 They call it a multiplication factor, and that multiplies
14 the economic -- multiplies the direct economic
15 contribution.

16 Q Isn't it true that you used a computer model to calculate
17 this number?

18 A That is correct.

19 Q And that you had control over the inputs and conducted
20 research on how to -- which inputs to put in; right?

21 A That is correct. We did do that research.

22 Q I'm going to ask you about some externalized costs.

23 Are you familiar with what externalized costs are?

24 A You better define that so everybody is on the same page.

25 Q Okay. So an externalized cost of a business may be a

1 cost that the business itself does not incur but is put
2 upon the community by way of that business's operations.

3 A Okay. Yeah. Sometimes we call that negative
4 externalities.

5 Q Negative externality.

6 A Yeah.

7 Q Okay. Did you consider any negative externalities in
8 your calculation of the \$5.2 billion figure?

9 A No. That's relative to those type of studies. That
10 would be external to the scope and not part of that.

11 Q In the event that a CAFO were causing groundwater
12 pollution, wouldn't that be a negative externality on the
13 community and the people of Washington State?

14 A Well, just to be clear, I don't know about what those
15 negative externalities are. I have no data on those
16 negative externalities, and so it's probably best that I
17 don't comment on that as I've never done any research on
18 that.

19 Q Okay. Did your \$5.2 billion figure include the costs of
20 groundwater remediation and cleanup on the families who
21 drank that water?

22 A No. It would not have included that.

23 Q Did it consider the costs of surface water pollution
24 caused by industrial dairy operations in Washington
25 State?

1 A Within that study, there was no indication that any
2 negative externality occurred, so it wasn't within the
3 scope.

4 Q Did it consider --

5 A So it wasn't within the scope, so it would not have
6 been -- there's just no application to that -- relative
7 to the 5.2 billion.

8 Q Okay. Did it consider the cost of environmental cleanup
9 and rehabilitation?

10 A Again, outside of the scope of the study, so it was not
11 included.

12 Q Okay. And did it include the impacts on the shellfish
13 industry of Washington?

14 A Again, no indication that the dairy industry is directly
15 responsible for that and no data to include any analysis
16 of that.

17 Q Did you include the impacts on salmon fisheries in the
18 state of Washington?

19 A Again, similar to the shellfish, I don't have any direct
20 data or evidence of that.

21 Q Did you include any healthcare costs, from asthma to
22 preterm birth to blue baby syndrome that may result from
23 groundwater contamination in drinking that nitrate-filled
24 water?

25 A No. There was no indication of -- I had data on that as

1 well.

2 MS. KINN: That's all I have. Thanks.

3 THE WITNESS: You're welcome.

4 JUDGE FRANCKS: Okay. Board
5 questions? Or redirect? Sorry.

6 MS. NICHOLSON: None from me.

7 JUDGE FRANCKS: Okay. Board
8 questions?

9 MR. WISE: Yeah. I did have one.

10 EXAMINATION

11 BY MR. WISE:

12 Q Good afternoon, Dr. Neibergs.

13 A Good afternoon.

14 Q I just had some questions about some of the figures in
15 your report.

16 A Okay.

17 Q I wanted to look first at Figure 4, which I've lost track
18 of. Where is it here?

19 A Page 4 as well.

20 Q Page 4. Okay. Total cost of operations per cow, I see
21 that Pacific Northwest has one of the highest costs, you
22 indicated.

23 Do you have any idea of why they have the highest
24 cost?

25 A So I looked through the cost lines across the different

1 regions reported in that figure and tried to say, is
2 there one, you know, notable outlier cost, whether it be
3 feed, whether it be labor, or whatever.

4 But there was -- it was just a general higher cost
5 across all that categories and that I couldn't attribute
6 it to one factor alone.

7 Q So there wasn't anything specific to environmental
8 regulation?

9 A No. And environmental regulation in compliance cost,
10 I've never seen that broken out on a dairy financial
11 statement.

12 Q Okay. And then Fig- -- the next figure -- or let's see.
13 Figure 3.

14 A Yes.

15 Q I see that Idaho is -- seems to be doing fairly well.
16 Do you have any idea why?

17 A Idaho jumps up and down, and these numbers jump up and
18 down, and Idaho is a very important dairy state.

19 You know, California, Idaho, and Wisconsin, and
20 Idaho has some unique characteristics with Chobani and
21 the dairy industry at that point, and so I don't know
22 exactly why that variation in Idaho occurred.

23 Q Okay. And the same for New Mexico on the other end? You
24 don't have any idea what's going on down there?

25 A I've been in New Mexico as well, visiting dairies and

1 participating and being a role as dairy financial
2 workshop.

3 And they're a cheese market outlet. As I
4 mentioned -- discussed, different classes. In Washington
5 we're a Class 4. They have a higher predominance.

6 In New Mexico, it's Class 3, and it's cheese, and so
7 it's very tied to the cheese market. And they come -- my
8 colleague down there who is an expert talks about lack of
9 competitiveness between the cheese factories.

10 And --

11 Q Interesting.

12 A -- so they have a lot of heated economic discussions on
13 competitiveness and pricing as you can imagine, which
14 occurs in other agricultural industries as well, but that
15 was New Mexico -- my experience with New Mexico.

16 Q Okay. But, again, you don't -- you don't see any
17 connection to the amount of environmental regulation in
18 these costs?

19 A Not -- not in that data, yeah.

20 Q Okay.

21 A It's just not separated out.

22 Q Table 4 on Page 10, there's costs -- it looks like these
23 costs are just lab costs alone?

24 A That is correct.

25 Q And there's cost for the various soil depths, and I -- it

1 was either testimony or some of the prehearing briefing,
2 it was talking about how much more expensive it would be
3 to go three feet down versus one foot.

4 And I don't really see that reflected in this table.
5 Am I missing something? It looks like it's \$32 no matter
6 how deep you go?

7 A That's correct. And that deals with the sample
8 collection cost is not included in that table.

9 Q So that would be -- would that vary?

10 A That would be an addition and based on information
11 subsequent to writing that report. We talked about that
12 ranging up to a hundred to get to that third foot level
13 would -- the collection cost would be \$120 per field
14 because that's a deeper sample than typical and just more
15 rigor involved with getting to that depth. So \$120 for
16 the collection cost for that third layer, if needed.

17 Q Do you know how much for the 12 to 24 level?

18 A Twelve to twenty-four, the cost estimate range was 50 to
19 80 dollars for the two samples combined -- for collecting
20 the two depths combined.

21 Q And the zero to 12 inches?

22 A The zero to 12 inches on the west side was 20 to 50, and
23 we went through an example where we used 30, but 20 to 50
24 on the west side just to get the first 12 inches cost.

25 Q Okay. So the lab costs aren't really the difference.

1 It's the collection cost?

2 A Collection costs.

3 Q Okay. Also on Page 10, you were talking about lagoon
4 inspection repair, and you said -- you gave a figure for
5 installing a lagoon liner.

6 Do you have any idea what kind of liner? It sounds
7 like we have everything from Cadillacs to dirt, so I just
8 wondered, you know, what level of liner you're talking
9 about there.

10 A That, I can't recall without investigating the reference
11 slides. It's work that Joe Harrison had reported on and
12 that he shared with me to use to get those cost
13 estimates.

14 So I can't tell you specifically relative to
15 Mr. Erickson's specific -- on his different liners of
16 what that liner was.

17 Q Okay. And, likewise, do you have any idea what lagoon
18 costs you're talking about there or should I --

19 A Up to the 500,000, you mean?

20 Q Yeah. I mean, it just references lagoon costs there, and
21 I just wondered what that was.

22 A Yeah. They were three case studies that Dr. Harrison
23 investigated and extracted those cost estimates.

24 Q Okay. Last question: If -- do you have any -- have you
25 looked at any statistics on what happens to these dairy

1 properties if they do go out of business?

2 A I have information on what they -- what they do if they
3 go out of business. And working and visiting with Farm
4 Credit Banks and talking with the dairies, it's a very
5 cutthroat deal because what happens is that if a -- if
6 the bank tries to sell this property, the rest of the
7 dairymen let the price fall like they're going to find
8 the bottom.

9 So -- and one case in specific is, one person had
10 sold his dairy, built a new dairy, and the first dairy
11 sale did not materialize, and it was -- his dairy has
12 been on -- the first dairy has been on the market for two
13 years.

14 So the point being is the value falls out of the
15 bottom if it's a collected property, and that's one of
16 the reasons why I mentioned on the banks that the --
17 their dairy loan portfolio is their highest risk
18 portfolio because they know on their collateral
19 collection value that the rest of the dairymen who would
20 buy these would let that value fall absolutely as far as
21 possible.

22 Q It just seems like if a dairy landowner was going to go
23 out of business and wanted to maximize his profit, he
24 would probably think about selling it to a developer.

25 Would that --

1 A Yeah. Absolutely. Absolutely. And in this particular
2 case, it was in New Mexico with very limited development
3 potential as to why that value is negative and holding,
4 but you're right.

5 In other areas, if there's development pressure,
6 that would definitely be a factor, and if you trace back
7 the growth in Idaho's dairy industry, a lot of it is
8 attributed to selling dairies in California with high
9 development value and then reinvesting it into dairy
10 operations with lower value.

11 Q And last question: Have you seen any trend where larger
12 dairies are buying up the small dairies and sort of
13 consolidating?

14 A Not so much that the large ones are buying small because
15 the economy is the size -- they would not -- if you have
16 a 3,000-cow dairy footprint, you're not interested in
17 operating a 200-cow dairy management facility.

18 But what happens is that, say, a dairy has 1,000
19 cows on this footprint. He's an expert and successful in
20 managing this 1,000-cow dairy footprint, he'll go over
21 here and purchase -- you know, buy somebody out maybe or
22 make a deal or develop another thousand-cow footprint
23 over here.

24 So there's one dairy owner with different
25 footprints, but if they're large, thousand cow plus,

1 they're not going to be interested in buying a few
2 hundred size cow dairy.

3 Q So because they're on separate properties, there's no
4 economy scale or whatever? I mean, it doesn't help that
5 you have that many more cows for profitability since
6 they're not in the same location?

7 A It's not as pronounced. There may be some, but it's not
8 as pronounced.

9 MR. WISE: Okay. Thank you very much.

10 THE WITNESS: You're welcome.

11 JUDGE FRANCKS: Ms. Brown?

12 EXAMINATION

13 BY MS. BROWN:

14 Q Just a couple questions. So to follow up on that last --
15 the questions that Mr. Wise asked, so larger operations
16 with a lot of cattle dairy cows aren't necessarily more
17 profitable, are you saying that or --

18 A I would say that they are gaining economies of size, and
19 what happens is that they're making a low margin on more
20 head.

21 So if they're making a \$5 margin on a thousand
22 heads, that would be 5,000. If they're making \$5 margin
23 on 10,000, they're making 50,000.

24 But that margin might improve from five to six
25 because their cost structure decreased and their

1 efficient increased.

2 And a good example of that is thinking about labor
3 efficiencies. You're a 200-cow dairy. You have labor
4 that's doing the mechanics. They're working -- they're
5 feeding the animals.

6 They're running the milking parlor. And they're
7 doing multiple tasks across the dairy. If you have a
8 3,000-cow dairy, you got one guy driving one tractor,
9 doing one function through all the barns. You got a
10 milking crew that's doing that function, and they're
11 working in the milking parlor working 24 hours a day.

12 And so you get labor specialization as an example of
13 those economies of size that can be gained.

14 Q So I was wondering if, as the financial pressure
15 increases on the dairy industry, does that push them
16 toward larger operations?

17 A Yeah. I think it fits into Mr. Wise's question, is that
18 with the 200-cow dairy in Whatcom County, that
19 development, you know, the development value is much
20 greater.

21 And you move to your bigger cow dairies, you're
22 gaining efficiencies of size and the competitive factors
23 through my presentation and comments has all been about
24 the financial capacity of dairies.

25 And as you get bigger, you have -- there's just

1 financial efficiency gains that are realized that drive
2 it to being bigger.

3 And so the industry trends are the decrease in the
4 number of farms but the number of cows increase. And so
5 the reason that happens is, those farms get bigger,
6 crowding bigger.

7 I mean, we could have a -- it's a really interesting
8 discussion on managing how many cows are on your farm,
9 but that's a little bit external to that but a real
10 fascinating discussion.

11 Q Another question I had was, you talked about how milk
12 prices can't -- don't really go up or can't go up easily,
13 that they're kind of fixed because of -- it's all the
14 same, I guess is -- is kind of what I took away from
15 that.

16 But then I got to thinking what about all the
17 different kinds of milk like, you know, based on how the
18 cow is treated and no hormones and all that, and seems
19 like there's different pricing on all that.

20 Doesn't that affect it?

21 A Some differentiation. And the point I was hoping to try
22 to communicate is that one individual dairy farmer that
23 isn't differentiating his milk, isn't trying to label his
24 own milk, but putting his milk into the big trucks that
25 you see is a homogeneous product that goes into the pool

1 that's set by the overall supply and demand conditions as
2 the milk is being used for these different purposes.

3 Q Okay.

4 A And so the no BST, no hormone, that gets back to the
5 production chain that's able to segregate out that no
6 hormone milk and market along those -- you know,
7 labeling, packaging, and delivering and marketing those
8 different values.

9 MS. BROWN: Okay. Okay. Okay. All
10 right. Thank you.

11 THE WITNESS: You're welcome.

12 JUDGE FRANCKS: Questions based on the
13 board questions? Ms. Nicholson?

14 MS. NICHOLSON: None from me.

15 MS. BARNEY: None from Ecology.

16 MS. KINN: None from me.

17 JUDGE FRANCKS: Okay. Thank you very
18 much. You are excused.

19 Ms. Nicholson, where do we stand?

20 MS. NICHOLSON: Well, I don't have
21 another witness that can fit into an hour time slot.

22 So --

23 JUDGE FRANCKS: That's actually okay.
24 In honor of the fact that it is Memorial Day weekend, I
25 would be happy to wrap up right now unless someone has

1 strong objections.

2 MS. NICHOLSON: That works for me,
3 Your Honor.

4 JUDGE FRANCK: All right. So we will
5 reconvene -- and I'll probably send everyone a letter on
6 this -- on June 5th, 9:00 a.m., here.

7 Thank you. We are off the record.

8 (Proceedings adjourned at
9 3:24 p.m.)

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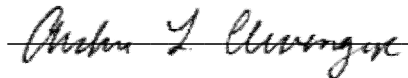
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IN WITNESS WHEREOF, I have hereunto set my hand this 18th day of June, 2018.


(Court Reporter, CCR No. 3041)

