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 TOPPENISH CREEK, SIERRA CLUB, WATERKEEPER ALLIANCE, CENTER FOR FOOD SAFETY, and RESOURCES FOR SUSTAINABLE COMMUNITIES,	)	PCHB No. 17-016(c)
Appellants,	)	
vs.	)	
STATE OF WASHINGTON, DEPARTMENT OF ECOLOGY,	)	
Respondent.	)	

HEARING
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BE IT REMEMBERED that on Tuesday, June 5, 2018, at 1111 Israel Road SW, Olympia, Washington, at 9:01 a.m., before ANDREA L. CLEVENGER, CCR, RPR, the following proceedings were had, to wit:

<<<<<< >>>>>>

JUDGE FRANCKS: Have a seat. Good morning. Let's go on the record. We are here for Day 6 of PCHB No. 17016C, and we are going to commence with another dairy federation witness.

MS. NICHOLSON: Yes. We're calling Dr. Joe Harrison.

JUDGE FRANCKS: Welcome. The court reporter is going to swear you in.

JOSEPH HARRISON, PH.D., having been first duly sworn by the Certified Court Reporter, testified as follows:

DIRECT EXAMINATION

BY MS. NICHOLSON:

Q Morning, Dr. Harrison.

A Good morning.

Q You're going to need some of those exhibit books behind you. Could you please pull out Exhibit I-1, and it's going to be the really big binder.
A Okay.
Q And is that your current resume?
A Yeah. As of January 2017.
Q Can you give us kind of a little bit of an overview of your academic experience. Your resume is rather extensive.
A Okay. So I just started my 35th year with Washington State University last Friday. And when I first started with WSU, I had 100 percent other research deployment with forages from a dairy nutrition standpoint, but working with agronomists and soil scientists as a team to look at forage utilization for dairies particularly in Western Washington.

And then so the concept was that if, between the soil scientist and the agronomist, they could fertilize and grow the crops, and my job was to feed the animals. So it was a team approach.

As part of that, we worked with a -- what was called the Dairy Forage Facility at Buckley, Washington, 200-cow dairy.

And I had -- I was a faculty member responsible for that operation, and coordinated with the staff for

management of the animals and facilities as well as manure handling.

During that time I was also involved in two enhancements in those facilities, to put in contemporary animal handling facilities as well as manure management aspects of the mineral lagoons, liquid-solid separators, irrigation systems, and so forth.

As time progressed through the decades, I then became interested more in looking at forages in a whole farm standpoint. A study in 1995, 1996 at Michigan State University with a federal agricultural research service scientist, Al Rods (phonetic).

And as a part of that whole farm look at forages, I also became more interested in nutrient management at the whole farm level, and was involved with providing enhancements to the model that Dr. Rods had developed.

Q Can you talk a little bit about your specific dairy experience.

A So with regard -- so in addition to the dairy in Buckley, also have -- currently have responsibilities as a faculty liaison to the WSU dairy in Pullman.

We have about 200 cows there. Some main herd that's for research and teaching purposes, and there's also a sub-herd within it of -- a student-run herd called CUDS, Cooperative University Dairy Students, that they also run

their own herd side. Picked up a teaching appointment in the last couple years as well.

And all the milk from that dairy goes through the creamery in Pullman Ferdinand's where they produce the Kerrygold cheese and ice cream there on campus.

Q Great. So you -- sounds like your research has multiple disciplines. You're usually working in a team.

Is that because it's more practically focused rather than academic focused or --

A Yeah. I guess, regards to whether it would be practical or -- it is more on the practical side than on the basic side, but the challenges out there just require more than one scientist to be involved.

So tend to work with agronomists, soil scientists, ag engineers, microbiologists, veterinarians, on all those projects.

Q And is that similar to your work with LPELC and can you define what that stands for?

A Yes. So the Livestock Poultry Environmental Learning Center is one of the extension education outreach programs I've been involved with for the last dozen years.

Over the last few decades, we've seen a dwindling of faculty at the universities that can address manure management. So a national level, a group of us decided

that it would be prudent to try to work together.

And so we were able to acquire federal funding on a water quality variant initially to fund the center. It's a virtual center kind of hubbed out of Nebraska, but we have over a hundred people across the whole U.S.

After the first five years, then we were able to acquire some money related to air quality issues in agricultural. So we still maintain an interest in education on the water quality side, but we moved into air. And then most recently, we also had funding for five years related to climate change.

So the center is pretty much anything manure and all livestock species. We have monthly webinars that are held nationally third month -- or third Friday of every month. We have a monthly newsletter that's sent out, and we have a list where people can ask questions, get answers on topics from their fellow experts around the U.S.

Q And what was the recent -- fairly recent topic on your webinar?

A So I'm on the -- in addition to being on the leadership committee -- overall leadership committee for Livestock Poultry Environmental Center, I also serve on the committee that determines Web cast and provides some guidance for that.

And with the interest particularly in our region, but also nationwide, with regard to lagoons, I became aware of some technology that was forthcoming to be able to manage -- to measure seepage rates in lagoons and also look at actual potential leakage in lagoons.

There's two different technologies. One is a system that measures the eight-hour period, or overnight is what they recommended. The seepage rate on the lagoons, fairly precise, and the -- then the other one is electrical array set of rods that goes down alongside the lagoon.

We can actually measure conductivity which gives you an indication of whether the lagoon has excessive movement of moisture out of the lagoon.

So we -- I hosted a webinar on that about two years ago, and as a result of that, we actually have seen that equipment become available through the western center of NRCS out of the Portland office, and it's available for use by dairies to look at seepage rates on their lagoons.

Q So this is technology that's available now? You can precisely calculate a seepage rate?

A Yeah. It's currently available.

MR. TEBBUTT: I'm going to object and move to strike to remove all this as irrelevant and beyond the scope of Mr. Harrison's report.

He didn't once mention anything about lagoon leakage or seepage in his expert report, so it's well beyond the scope.

MS. NICHOLSON: He's explaining his experience and background and why he has the expertise that he has.

JUDGE FRANCKS: I'm going to allow it.

Q (By Ms. Nicholson) Dr. Harrison, can you talk a little bit about who funds your research?

A So about mid-career, I kind of moved from one end of the county to the other. So I still do nutrition work, still do the forage work, but we also do a lot of nutrient management work, so look at aspects of a variety of aspects of manure management and, in particular, try to explain it as we're looking at -- particularly as it relates to fate and transport of both nutrients and pathogens with manure systems.

And that work has primarily been funded through NRCS, Natural Resource Conservation Service, at the federal level through their program called Conservation Innovation Grants.

They also went through decades of reduction in staff and got to the point where they were able to do their own research. They relied more heavily on external teams to do the research.

So through those Conservation Innovation Grants, we had particularly focused on nutrients and their fate to transport and the environment as well as pathogens.

Q So can you talk a little bit about pathogens.

Does that include viruses?

A Okay. So the work we did with the Conservation Innovation Grant on aerobic digesters and pathogens was still to look at -- so you start out with manure on the farm.

Then it goes through the inner digester, produces methane gas that's used for electrical generation, but the subsequent liquid and solid streams are used for bedding for the cows. They're used for compost or they can be used for land application for crop and irrigation.

So we monitored manure through each one of those steps, and as we did, we had those assayed through our veterinary school in Pullman and the microbiology group there for a number of pathogens that would be of concern for the cattle.

But we also were of interest for looking at organisms that would be of zoonotic concern, and zoonotic means pathogens or bacteria or in a case, I guess, lump viruses in with that as well, if there were viruses that had a concern that were of in this case cattle origin, which would have -- be transferred and be a concern with

humans.

So we did look at some, you know, a number of the microorganisms, but from a virus standpoint, there really aren't any viruses that are of cattle origin which are then going to be of a concern for humans.

Q So would you -- do you agree or disagree with the Ecology's concern that they need extra -- an extra foot of attenuation for viruses?

A Yeah. So during the proceedings over the last two weeks ago, I listened to a suggestion that there needed to be an attenuation area for attenuating or killing or reducing a number of virus below the lagoon.

And since there aren't viruses from cattle that are of human concern, it would seem that's not really a good justification for that particular attenuation phase.

Q Can you talk a little bit about your specific experience with CAFOs?

A Okay. So same group of people at the national level that worked -- colleagues like myself worked on the coming together for the Livestock and Poultry Environmental Learning Center about a dozen years ago.

Prior to that, a group of us worked with EPA at the national level when the CAFO permit -- the CAFO permit was released.

In approximately 2000, it went through some reports,

and I think the final version that was released in about 2003.

Our effort as a group was to try to take the language that was in these permits and try to put it into fact sheets which could be understood by advisors to producers as well as the producers themselves, so trying to describe in a way that could be commonly understood by those that are going to be, you know, actually putting the permits in place on farms.

MS. NICHOLSON: I'm going to move to admit Exhibit I-1.

Q (By Ms. Nicholson) And ask you to look at Exhibit I-2 and tell us what that is.

JUDGE FRANCKS: I-1 is admitted.

(Exhibit No. I-1 admitted.)

A I-2 is expert report.

Q (By Ms. Nicholson) Is that the expert report you drafted in this appeal?

A Yes.

Q Dr. Harrison, there's been some testimony that might be a little confusing for the board requiring -- about requirements dairies including CAFOs must comply with.

Can you explain to the board the requirements that all dairies must comply with?

A So a bit of history, 20 years ago this year, so 1998, the

dairy industry requested of the Washington State legislature to pass what's called the Dairy Nutrient Management Act of 1998.

And the intent for that act was to require that the dairy industry -- all dairies in the state, regardless of size, no matter small dairy or large dairy, small number of cows or large number of cows, you were to be required to get one of these to be, you know, under that law.

And kind of simply put, the concept of it was that, with the nutrient management plans that were required that you had to collect the manure, you had to store the manure, and then you had to apply the manure in an agronomic rate.

It's kind of a two-phase process because it was fairly new to the industry. The other thing that was interesting at the time was that a few other states that were requiring large operations to have nutrient management plans, the -- they weren't requiring all.

In Washington, they decided that everybody needed to play by the same rules, and so all dairies are required to have this.

So they had -- the first phase was to develop the plans, and those were developed by conservation district staff typically and in a few cases some consultants. And the guidelines for developing those plans were the NRCS

practice standards.

And then in the subsequent about two-year period, they were to implement those plans and at that point then certify that they were implemented and actually in practice.

Q So would this include manure lagoon design as well?

A Yes, it did.

Q So since 1998, all dairies, regardless of size, must comply with NRCS guidelines under the Dairy Nutrient Management Act?

MR. TEBBUTT: Again, objection. This is well beyond the scope of the expert report. There's nothing in there that discusses all of this, and it's well beyond the scope.

MS. NICHOLSON: Again, this is part of his experience. He's been doing this for over 30 years, and he has the experience to speak to the history of the Dairy Nutrient Management Act, and he's trying to clarify what requirements dairies are under.

MR. TEBBUTT: Should have been part of his expert report. This is unfair.

JUDGE FRANCKS: Well, I'm going to allow it. And you'll have a chance on cross-examination to --

MR. TEBBUTT: Right. But the whole

idea is preparation, and that's why we had expert reports, and they're going beyond the scope of it.

MS. NICHOLSON: The expert reports were not required in this matter. We voluntarily put them out there.

It's not like that anybody is strictly held to anything within the expert report. That's not what the point of it was.

It's not like we submitted them in lieu of testimony, and he was also deposed.

JUDGE FRANCKS: I'm going to allow him to testify about this.

A So ask the question. I think it had to do with following the standards.

Q (By Ms. Nicholson) I think it did.

A So, yeah, to my understanding, lagoons built since 1998 would have been required to meet the NRCS standard.

Q And what inspections are included in that -- under that act?

A So as a part of the Dairy Nutrient Management Act currently, the dairies that receive an on-site inspection by staff members from the Department of Agriculture every 18 months.

And the reason for that 18 months is so that you can move around the course of a calendar year so that you

aren't always getting inspections when the weather is really nice.

I mean, so if you're skipping around at an odd number of months, then you don't also get a visit when it's not so nice.

Q Thank you.

Could I have you look at Exhibit I-49, please.

A Okay.

Q And here you might need your pointer.

And is this a figure that you included in your expert report?

A Don't know if it was with the expert report.

Q It's a figure that you drew to explain the nitrogen cycle?

A Yes. Nitrogen cycle. And this cycle has been discussed and presented in various forms.

Q Can you give us an overview of the nitrogen cycle in relation to plant growth and crop nitrification?

A So if we envision up here where it says "nitrogen cycle," it's kind of being the soil -- soil surface level here.

Normally what I do with this diagram is kind of step into it and bring pieces of the -- but you're getting it all in one full blast here, so bear with me.

So all these processes, as we go from, say, nitrate to ammonium and organic nitrogen, these are all processes

which are driven by bacteria.

And, in contrast, the pathogenic bacteria, which has been brought up during this hearing, these are good bacteria, bacteria that we actually like to promote their growth and their function.

So when manure is applied, it's primarily in the ammonium form. Very little, if any, nitrate in manure itself, even lagoon stored.

And so once it's in the soil, the first form then is ammonium, and that goes through the process called nitrification, bacteria to nitrate.

And the nitrogen tends not to stay in this ammonium form because the process is overwhelmingly driven towards nitrate, and actually the crop tends to prefer nitrate as a nitrogen source as well. So that step is called nitrification.

The other -- then nitrate can also certainly be taken up by plants. Nitrate can also be immobilized here on this left side where the bacterial breakdown in the organic from fraction, which then that's a more stable form in the soil.

That organic fraction, whether it comes from manure or from bacteria processes and so forth, are roots of the plants then can be what we call mineralized.

We've heard that mentioned before in the hearing,

but it brings it back around to the ammonium. So all these things are current at the same time at different rates and are all affected by water and temperature.

Then some other arrows here that are important to note. We've got one here where if ammonia is, say, applied on the surface of the soil, you can have some ammonia losses, and then that wouldn't be available for plant uptake, so that's a volatilization step.

And then we have -- when ammonia comes on over to nitrate, we have this denitrification, which nitrogen gas can go off to the atmosphere or it can go off as nitrous oxide.

There's one arrow that's not on here, and there should be an arrow here on the left that would go from nitrate and point downward where we can have movement of nitrate through the soil, as has been mentioned over the last two weeks ago.

Q So does this include the cycle of nitrification-denitrification?

A Yeah. So that was brought up this week, two weeks ago as well, this process of taking ammonia through a nitrification step to nitrate and then a denitrification.

So there's this -- what's considered -- what's -- the term is coined coupled nitrification-denitrification.

So that would take ammonia to nitrate and then the nitrate on to nitrous gas or -- nitrogen gas or nitrous oxide.

Q Is there a source that you rely upon for your information on coupled nitrification-denitrification?

A Recently in this hearing, it was mentioned as it related to the Baram paper where they suggested that, under the layered lower point of the lagoon, that ammonia coming out of the bottom of the lagoon could actually be converted to nitrate and then on to nitrogen gas.

So that would be the -- that coupled biological reaction.

Q Could I have you look at Exhibit R-20, which is behind you in the Ecology books.

And is that the paper you were referring to?

A Yes. This is the Baram paper. It's been discussed two weeks ago.

Q And where was this paper published?

A Pardon?

Q Where was this paper published?

A The journal is Journal of Environmental Quality.

Q And is that a reliable source?

A Yes. The Journal of Environmental Quality is in the academic world called a high impact factor journal. I published one paper in the journal a number of years ago.

So I got some sense of rigor, but they require that -- it's a journal that really wants to publish new findings and findings of particular significance.

Q So would you consider Mr. Baram's discovery of coupled nitrification-denitrification to be a new and important discovery in this field?

A Yeah. I think -- well, I guess I wouldn't couch it as they discovered it, but the results of the paper and then connecting that with this coupled reaction certainly helped explain the variability that's seen in studies relating to what happens to nitrogen under manure lagoons.

MS. NICHOLSON: Okay. I would like to move to admit I-49 and I-2.

JUDGE FRANCKS: I-49 and I-2 are admitted.

(Exhibit Nos. I-49 and I-2 admitted.)

Q (By Ms. Nicholson) And can you take a look at Exhibit I-50, please.

A Okay.

Q And before we begin, can you explain the difference between a fall soil nitrate test, a PSNT, a pre -- you'll have to define that one -- and the spring soil test.

A Okay. So in a world of management of manure for crops,

that is a part of that, part of that system, using soil samples. Typically think about three different time periods where we would take samples.

So one would be considered spring. And to give the -- everyone a bit of a feel for that, depending on when spring occurs, it's really that time of the year when we could actually see a beginning of grass growth or crop growth.

So in some cases, that could be as early as February or it could be as late as May, depending on the region. In our region, certainly we have green-up or the growth of the crop as early as February. So we have pretty wide window then for when a spring test can be taken.

Then there's a second test -- and that could be for any crops. There's a second test that's called the PSNT, so it's called Pre-Sidedress Nitrate Test, and that particular test is really specific to corn.

The concept is that that test is taken in the early growing season of the corn, so it's really outside of the spring window. It's in early -- well, I wouldn't really consider early summer, which would be the late May to early June, and right now.

And that test is taken when the corn is about six-leaf stage, so it's about this high. So you want to get the corn at a low stage of growth, so height, get a

soil sample, determine whether or not there looks like there's enough nitrogen there for the rest of the growing season for that corn crop and -- at that point in time.

So then you can decide, yeah, might want to add some supplemental nitrogen, or, no, it looks like the crop will do fine and go all the way through September or October.

The reason for taking the test then is the crop is low enough, if you then run equipment through the field to apply extra nitrogen, you aren't going to damage the crop.

So those are the first two tests, so spring test and then the Pre-Sidedress Nitrate Test, which is really an early summer test.

The third test is the fall soil nitrate test, and that's typically taken at -- well, it is taken in the fall.

Q Can you look at -- well, first of all, are you familiar with the CAFO permits in this matter?

A Yes.

Q Both the State and the combined?

A Yes.

Q Could you pull up R-2, which is one of the CAFO permits, and go to Page 48 -- nope. 17. PDF Page 17.

A You said R-2; correct?

Q Yeah.
A And you said Page 17?
Q Yes. And what section I'm looking for is S4.I.1.
A Okay. I'm there.
Q Actually, in that entire section, can you explain which of the tests that you just described are required under the permit terms?
A So the spring test and the fall test are the two tests that I am aware of that are part of the permit.
Q So the PSNT, which applies only to corn, is not required under the permit?
A I did not see it in the permit, no.
Q I'm going to have you look at Exhibit R-4.
And are you familiar with Exhibit R-4, which is the literature review?
A Yes.
Q Could you turn to Page 48 in PDF, and it's going to be Page 46 for you, Dr. Harrison.
A Okay.
Q And it's kind of throughout this section, Pages 41 through 46 for you, Pages 43 through 48 in the PDF.
Looking at this lit review, is it correctly equating PSNT and the spring soil sample?
A Well, as I read through it originally -- I actually had an opportunity to listen to Ms. Redding present this at

an EPA CAFO meeting a few years ago as well -- it -- one could be a bit confused that the spring test and the PSNT are -- that there's kind of a mixing when those are discussed.

Particularly, if you look on Page 46, it says "spring soil nitrate test" and then it says, parentheses, "Pre-Sidedress Nitrate Test." That's really not a spring test.

So if one were to go back to the literature review as a backup to the permit, I think one could be somewhat confused.

Q And do you think that this literature review contains a clear analysis of why spring soil nitrate tests are required?

A You know, as I reviewed this recently, I -- I'm not seeing that clarity.

Q Could you -- let's see. I think we need to go back to Exhibit I-50.

A Okay. I got that one.

Q And just to begin, do some crops use more nitrogen than others?

A Yeah. So if we look at Panel A and Panel B, Panel A being the top panel here, it's grass. We have Panel B on the bottom.

So the grass can take up as much as four to five

hundred pounds of nitrogen during a growing season and has a much longer growing season. So that's the major reason it can take up more nitrogen than a corn crop can.

Corn crops can be somewhere in the neighborhood of maybe 200 to 250, depending on Eastern Washington versus Western Washington. We get much higher yields because of the heat in Eastern Washington, so grass is going to consume a lot more nitrogen or uptake a lot more nitrogen.

Q And what effect does plowing or aeration of the soil have on it?

A In management of soil for crops, particularly for corn, I guess you're going to plow that every year, or if in the grass you've got a grass sand that's beginning to fail, you've got a lot of spotty places, got an encroachment of weeds and you want to reseed that, so it would be a nice lush expand again.

When that soil is tilled, it kicks off all this bacterial action that breaks down the organic nitrogen there, and we get a rather large pool of nitrate that's formed when that land is prepped, so any land prep.

So that's one of the reasons why there's been an interest in moving towards minimal or no till practices.

Q Can you give us an overview of the common cropping methods and the types of crops grown in the state?

A So in Western Washington, we certainly see -- I kind of use the thumb rule 50, 50 plus percent of our land acreage is grass, and the other half is about -- is in corn or corn silage.

On the east side of the state, we have limited grass, but we have a lot of alfalfa because it's a good environment there for alfalfa and good soil conditions from the standpoint of moisture, and then the rest of it will be corn.

In addition, over the last 15 years, we've seen a big increase with the corn crop that what producers will do is, they'll grow the corn crop, say, from about May through September, October, and then right after that, they grow a second crop, which is most often triticale. Sometimes they'll plant wheat or some other small grain, but most of the time they plant triticale to have -- well, to protect the soil, for one thing, but also to utilize the nutrients that might be left there after the corn crop.

Q Is that what double cropping is?

A Yes. In this case, considered double crop because you get two crops, or the other term that's used for that second crop is a cover crop.

Q Okay. I'd like to turn to the exhibit -- and, actually, you can look over your left shoulder because I'm going to

talk a little bit about Table 3. We could also pull that up. That's S4.K in the permit.

And what tests are they -- what test are the actions taken from in this table? Is this the fall soil nitrate test?

A Yes. The adaptive management suggested in Table 3 is a result of obtaining a fall soil sample and then looking at the nitrate level in that sample.

Q What guidance exists regarding the fall soil nitrate test as a tool for nitrogen management?

A So there was a bulletin published by Washington State University and Oregon State University about 2002 that's been referred to in the hearing previously.

Q And we referred to that as the Cogger and Sullivan?

A Cogger and Sullivan publication on fall soil nitrate.

Q Could you please pull up Exhibit R-12.

A Okay.

Q And is this the guidance that you were referring to?

A Yes, it is.

Q And what was your involvement in developing this guidance?

A So in the late 1990s, early 2000s, when I officially had the title livestock nutrient management specialist of Washington State University, got more serious about bringing together teams to work on nutrient management.

There had been some concerns over the bulletin that was prior to this one was called a report card test. It seemed to have the -- well, folks were concerned about the lack of guidance in it and in trying to interpret it and really trying to make it a good on-the-field practice guide for producers.

So I decided that, well, anytime there's -- that situation arises, the best thing to do is bring everybody together. So brought together the scientists Cogger and Sullivan. Sullivan was in Oregon at that time. Cogger was in Washington State University.

Brought together conservation district staff. At that time Barb Carey was doing some work with the Department of Ecology where they were heading fall soil nitrate numbers. We had system of our own from our program.

And so we had a two-day workshop in Puyallup basement of a hotel there, and after that two days, there was agreement that there should be a revised bulletin published.

And so over the next couple years then, this bulletin was drafted and reviewed and then we came up with the final draft.

Q Okay. Is this applicable statewide?

A As it was originally written, it's really meant to be

used as a Western Washington guide, and that's what it says in the document, so --

Q But is it used statewide?

A We have seen it used to provide some guidance on the east side, although that wasn't its original intent.

Q And for how long and to what extent have producers been using this guidance?

A Well, it was published in 2003, so we're going on 15 years now.

Q And do the producers rely on this guidance?

A Yeah. It's used regularly, and particularly there's some management table -- suggested management tables in there, Tables 3 and 4, that are used to help provide adaptive management based on those numbers.

Q So what kind of -- what sort of crops does this guidance take into account?

A This takes into account both annual crops, which would be corn as well as perennial crops, which would be, as stated in this bulletin, would be grass for silage or grass for hay.

Q And is this guidance reflected in Table 3?

A Conceptually, I -- I would say it is, but in terms of -- there's some distinct differences. One is the absolute numbers, cutoff numbers here are different than are in the fall soil nitrate guidance.

The other thing is that the table behind me, Table 3 that's in the permit, is a four-level system where it goes to the very high level as well, and the guidance bulletin is a three-level system.

Q So the guidance that -- the guidance is different from the permit terms; is that correct?

A Yeah. There are differences.

Q And this guidance accounts for annual and perennial crops separately, but Table 3 does not.

How will that affect producers?

A Yeah. So after -- so I provided comments during the drafts of the CAFO permit, but when the final permit came out, I was reviewing it for some reason, and I noticed that -- related to the crops, that it talked about annual crops and particularly in reference to Table 3, but what about perennial crops?

And I wasn't seeing anything in there with regard to perennial crops. So I sent off a -- I checked with my -- one of my fellow agronomists, soil scientists I work with, Andy Bary, and say, "Andy, check me here. I'm one to jump the gun on this, but it seems to me like there's something missing here."

And Andy said, "Yeah. You know, looks like the perennial isn't being considered."

So it would -- could leave one to consider that

there isn't guidance in -- or isn't -- perennial crops aren't considered as part of the permit, and that leaves confusion for producer, for advisors.

If they come back to me and say, "What do we do," I'm like, "Well, better talk to the agency. I don't know. I didn't write the permit."

And so --

Q So the terms may or may not be attainable for producers; is that fair?

A Yes. That's a fair statement.

Q Looking back on Table 3, do you agree that for every field, regardless of what is grown or the time it's grown or where it's grown or what is being grown, that it's ideal to have 15 parts per million of nitrogen?

A No. An example of that would be with where we have corn and then after that is triticale is grown.

Q And that's a double cropping situation?

A Yeah. That would be a double cropping situation. And there's a thumb rule, like 15 part per million, multiply that by 3.5, and you get about 50 pounds of nitrogen.

Triticale crop, through its growing season, could easily take up as much as 150 pounds of nitrogen. So if you had 15 part per million nitrogen there, that would not be enough nitrogen for that crop, and you would have to add some additional either manure nitrogen or

commercial nitrogen.

Q So looking, again, at Table 3, would it ever be desirable to have a high fall soil nitrate test?

A So, for instance, again, using the triticale as a double crop following corn as an example, so if we were here at this very high -- the range there is 31 to 45.

So if you were around, say 31, 32, multiply that by your thumb rule of 3.5, and you get about 100 pounds of nitrogen.

You could still use another 50 pounds of nitrogen to grow that crop, and so it's easy for me to see where you would actually want a high number going into the fall in order to grow that triticale crop.

Q So -- and, again, you're describing planting triticale after corn.

And is that a common practice on dairy CAFOs throughout the state?

A Yeah. Both Eastern and Western Washington.

Q So under that scenario where you're growing triticale after corn and you actually want a higher number, you want something in the high range to account for both crops, would the required actions based on trends, which is the third column on Table 3, result in a less productive stand? And could you also define less productive stand?

A Yeah. So if you don't have enough nutrients for the crop, it's not going to be as dense. You're not going to get as good a yield. You're not going to get good nutrient uptake.

And what we've kind of been talking about, this corn triticale and same with the -- would play out with a grass crop as well. If you don't have enough nitrogen there, you begin to get bare spots. You can get encroaching weeds. The stand doesn't last as long.

And we get into the scenario where that grass crop has to be killed out, replowed, reseeded. So you go through this period of the land is not as productive, and you have a chance for nitrate -- nitrate losses, as the Carey report showed.

Q So is -- and I'm going to use the term "agronomic application of nutrients." Is that something you can define for us, as you define it?

A So agronomic rate -- and I know there's been some discussion about whether that's a good term or not, so in my world with scientists and advisors, we use crop uptake, agronomic rate to be approximately the same terminology.

So that would be my description of it.

Q Okay. Is an agronomic application of nutrients or application for crop uptake, is that a component of a

productive stand --
A Yes.
Q -- of crop?
And is a productive stand more protective of groundwater?
A I think so.
Q And why?
A Well, you've got better control of water infiltration, so that -- particularly because you've got now a very dense root mass. It's going to help create a soil percolation of water. You're going to have more uptake of nutrients because you've got more crop there per unit -- per unit area.
Q Have you testified regarding CAFO permits before in this state?
A Yes. Eleven years ago. I testified -- I don't think it was this room, but here in Olympia for the last CAFO permit.
Q Could I have you look at Exhibit I-60 and tell me what that is? It's going to be in the big book.
A Okay. It says it's "Finding of Fact, Conclusions of Law and Order."
Q And is that regarding the 2006 matter in which you testified?
A Yes.

Q And could you turn to Page 36 to 38. And it should be the same number in the PDF.
A Okay.
Q And does some of your testimony appear in these findings of fact and the conclusions of law?
A Yeah. I see my name mentioned there.
Q And the 2006 matter, did you testify that groundwater monitoring was not necessary for the CAFO permit to be protective of groundwater?
A I did.
Q And is that still your opinion?
A It is.
Q Why?
A As has been discussed previously, the Carey report, the study did in cooperation with Department of Ecology.

MS. NICHOLSON: And one second. Can we pull up that study. It's R-15.

MR. TEBBUTT: Again, I'm going to object. This is beyond the extent of the expert's report.

And if we didn't do expert report -- I mean, we did expert reports not so a witness can testify about whatever he wants at the hearing.

There's a reason for those, and we're going well beyond the reason for those and outside the relevance and

the scope of the expert report.

MS. NICHOLSON: This is the findings of fact, conclusions law of the previous CAFO permit in which he had this exact same opinion that he's presenting today.

MR. TEBBUTT: Right. And now the industry is trying to sneak in all this stuff through stuff that is outside the scope of the expert report.

JUDGE FRANCKS: Okay. The expert reports are not something that's required under our rules, so it's not limiting anyone in this situation.

So I'm going to allow him to testify.

A Okay. So where's the document? Which book? Sorry.

Q (By Ms. Nicholson) That's the Ecology book under R-15.

A R-15. Okay. So this is the Carey report that was previously referred to.

Q And can you describe your participation in this study?

A Yeah. So I was collaborator on this study. Department of Ecology came to WSU, asked if we would be interested in being involved in this study.

Gladly agreed. I think it's important to do these long-term studies, in particular. They're so rare, so -- and, in particular, as it relates to the question of, do I think groundwater -- or do I think the permit would be protective of groundwater on the abstract, which is

Page XI.

Okay. So it's a little small for the board to see, but, anyhow, third paragraph talks about -- talking about the average monthly nitrate concentration in the shallow groundwater monitoring wells.

They range from about 5 and a half up to about 30, and then there was one well had a maximum of 45.

Under Point No. 2 -- so that kind of gives you the global view, but under Point No. 2, with regard to these nitrate concentrations, it says that, "They were generally below the ten milligram per liter when nitrogen loading was similar to crop removal."

So, to me, this -- in this abstract, that's in the conclusions or summary statement as well that, when the producer managed their land so that it was at crop removal, the shallow groundwater was below the ten milligram per liter.

And something else to understand about this study was, we -- it was really kind of a case study, an evaluation, in that we simply studied what the producer did.

We didn't control what he did. We didn't control when he applied his manure, what time of the year, what rate, whether he applied commercial fertilizer, whether he irrigated.

We just simply studied what he did, so there weren't lots of opportunities for us to have made that No. 2, but -- that statement No. 2, but we were able to observe that.

Q And wasn't there a one deep well in this study as well?

A Yes. So there's these six wells, but there was also a seventh well that was a companion to one of these. These wells are about six to eight feet deep.

There was one that was about three feet deep. I believe it was AK746 or something was the number, but, anyhow, it had the maximum number -- maximum amount of nitrate that it showed was .3 part per million, which would be less than one milligram or liter of nitrate at that 30-foot level on that same field.

Q So this study supports your opinion that groundwater monitoring is not necessary to be protective of groundwater; is that correct?

A That's correct.

Q Do you know of any scientific paper or study to the contrary?

A No, I don't. And this study was conducted since the last hearing, and it's the only one I know that has combined all the agronomic pieces intensely as well as looking at the shallow groundwater with wells.

MS. NICHOLSON: I move to admit

Exhibit I-60.

JUDGE FRANCKS: I-60 is admitted.

(Exhibit No. I-60 admitted.)

MS. NICHOLSON: And also I-50, if I didn't do that before.

MR. TEBBUTT: I believe, again, I-60 is the decision from before, and you already said that that wouldn't be admitted because it's just part of the case.

JUDGE FRANCKS: So true. That is not necessary to admit, but --

MS. NICHOLSON: Okay. I believe that's it.

JUDGE FRANCKS: I did admit I-50, though.

Ms. Barney, are you next?

MS. BARNEY: I believe so.

CROSS-EXAMINATION

BY MS. BARNEY:

Q Good morning, Dr. Harrison.

A Good morning.

Q I had a couple questions on the early work that you described to Ms. Nicholson, the work with regard to the anaerobic digester.

A Yes.

Q You said in that, you used -- you studied the digester at a particular dairy?
A Yes.
Q And was that just one dairy?
A Actually, we had two -- there's two different studies. The one that was funded by the Conservation Innovation Grant program, NRCS, was in Monroe, Washington.

And the original intent, that was going to be a community anaerobic digester. When it went online, actually started producing, it was from a single dairy.

But previous to that study, we had looked at a community digester in Tillamook, Oregon, and that dairy -- excuse me -- that anaerobic digester was receiving manure from about 12 to 15 dairies in the Tillamook area, where they brought their manure in by truck and went through the digester.

And then the liquid stream, after going through anaerobic digestion, then was trucked back to the dairies to be used as fertilizer, so --

Q In that Tillamook study, did you examine pathogens in relation to that as well?
A Yes, we did.
Q How many digesters do you know of that are on dairies in Washington?
A I believe the number right now is about eight.

Q Okay. So the work on the pathogens, you only looked at material that had already gone through the digester?
A No. We actually sampled the manure before it went into the digester. So I'll give you the long answer, if that's okay.
Q Sure.
A When we got the original grant, the idea was that we're going to have this kind of once-in-a-lifetime opportunity. It was a new digester, and there were about six dairies that were interested in being part of communing their cows' manures to that digester and then receiving the liquid stream back.

And the idea was to look at what were the types of bacteria, particularly the pathogenic ones, from a biosecurity standpoint. So if one dairy was pretty clean with all these types of bacteria and didn't want bacteria this other dairy might have, it might be with what we considered a biosecurity concern.

So during the early phases of the grant, we actually went on a monthly basis and looked at -- took manure samples from cows on those dairies and looked to see whether they had salmonella, whether they had E. coli, which is the Jack in the Box bacteria that we are so concerned about, and a number of other bacteria.

And so we looked at the material before it ever

entered the digester. Then at the time that the digester actually came online, only one of those six dairies continued to be involved with providing manure, but we continued to look at the manure stream coming into the digester.

In Washington State, digesters are allowed to utilize as much as 30 percent of the feedstocks. The material coming into the digester can be what's called pre-consumer food waste, and that's regulated by the Department of Ecology.

So in the case of the digester in Monroe, they take blood from the slaughter plant. They take grease trap waste from restaurants, and then one interesting material they take is with what we call -- well, it's expired beverages, so beers, wines, pop, Starbucks drinks.

All those sorts of things can be then -- they have a really high sugar content. They make a lot of methane, so they can -- so we assay each one of those before they went into the digester as well.

Q For bacteria or virus or both?

A For pathogens, yep. And so we looked at all that. So we actually took samples before it ever went into the digester.

Immediately after it came out of the digester, then it went through a liquid solid separation step. So we

then took another sample of the liquid after it came across the liquid solid separator.

Then when the large particle solids came off in a pile, we sampled those. And then when the material went through a composting, we also assayed post compost.

And then the liquid that got stored in the lagoon, we also did some pretty intensive sampling on the material after it had been stored in the lagoon. So it was pretty extensive.

Q And I believe what I heard you say was that -- that you did not -- at the close of that study, you had not found any pathogens of concern in the sampling?

A From a virus standpoint.

Q From a virus standpoint.

Did you from a bacterial standpoint?

A So depending on the organism, you can get as much as 90 to 99 percent kill of the organisms. So in some cases -- in some, we would see 100 percent kill.

The one organism that was particularly resilient seemed to be a bug called mycobacterium paratuberculosis. It's an organism that affects cattle, and it gives them a wasting disease. They're called Johne's disease, so that one seemed to be particularly resistant.

Q So the -- so your understanding is that the digester actually acted to inactivate the bacteria and potentially

inactivate viruses?
A Yes. Particularly the bacterias, yes.
Q So -- but in terms of looking at manure applications or lagoon storage for facilities that aren't using digesters, you've never looked at that from the standpoint of pathogens; correct?
A Yes. Actually, we have. So when we did comparisons of the manure -- so another piece that we did, in addition to taking it all the way to storage, was what would happen upon land application.
Q But as the result of the digester or just straight land application of manure?
A Both.
Q Okay.
A So we actually ran a three-year study, looking at the nutrient uptake from anaerobically digester manure and non-anaerobically digested manure, and we compared that to control which had nothing, and then we had a positive control, which was urea nitrogen.

So when we did those studies, we also looked at reductions in the pathogens, using E. coli as an example, on land application and looked at the die-off curves for those.
Q And did you look at pathogens in relation to lagoons specifically, storage lagoons?

A Yeah. We actually -- sent staff out in my square stern Coleman canoe, and they flew it to the lagoons and took samples at multiple depths and we looked at -- over a three-month period.
Q Within the liquid?
A Within the liquid.
Q Did you look -- did you ever have the opportunity to look at what may have seeped or escaped underneath the lagoon?
A So we looked at three different depths, so --
Q But still within the lagoon itself; correct?
A Within the lagoon, correct.
Q Okay.
A I have not been involved in any samples taken below the bottom of the lagoon.
Q Okay. Thank you.
Could I ask you to look at I-51, please.
A Okay.
Q Is this the study you just described to us with that application in the urea control?
A Yes.
Q Could I ask you to look at Page 7 of the document, please.
A Okay.
Q So looking at Table 8 in this document, can you tell us what this table contains for values?

A This table summarizes the soil nitrate in the top foot over a three-year period of time.
Q And the sample dates there, going down the left-hand column?
A Yes. So we started in May of 2009, and it goes through November of 2011.
Q Okay. If we can just sort of look at 2010 for the moment, looking at the first sample date, the 26th of February --
A Mm-hm.
Q -- those soil nitrate values are in the area of 12, 11, 15, 15, 13, and 14 there, going across?
A Correct.
Q For all the various applications?
A Correct.
Q Is that -- is that number significant with regard to someone who's trying to plan a nutrient budget for their facility for the year?
A Significant, so should they consider them? Would that be the --
Q Yes.
A Typically, we don't.
Q And why not?
A Because the numbers are low enough that they don't provide that much nitrogen for the crop and because the

time of the year they're taken. So in February --
Q So you had mentioned spring soil sampling before in that in Washington that can be as early as February; correct?
A Well, I said that spring sampling could be as early as February, but my position has been that a spring sample in Western Washington is really of little value for making nutrient application decisions.
Q And the reason for your opinion on that is?
A We have lots of rain over the winter, and that -- it just -- the amount of nitrate that's in there in the soil in the early part of the year is minimal.
Q So -- but these values, in reading this study, there are -- the values just above that, the 30th of November, there were no nutrients applied to these fields between the 30th of November and the sample date of the 26th, and yet there seems to be still quite a bit of nitrate remaining in the field from the --
A Right. So I don't know whether the -- there's temperature data in this or not, but the other thing that's occurring at that point in time, and particularly for us in Western Washington, is the crop is actually growing, and if the crop is growing, you've also got all the microbial actions going on.

So if one is trying to go from 30th of November on 11 or a 12 -- yeah, so ten to twelve and then looking at

numbers that go from about 11 to 15, and that four part per million increase, I'm concluding that that's a result of the bacterial action on the organic nitrogen there actually producing some nitrate, which then can be taken up by the crop.

Q Mm-hm. So -- but having nitrates still existing there, then it's not all washing away through soil; right?

A No.

Q So there is still some to be considered if one was going to put together a nutrient budget?

A You could.

Q Might be small?

A It would be small, but you could.

Q Yeah. Okay.

A Math could be done.

Q Math could be done.

A Excel spreadsheets do wonders.

Q So if I could get you to turn -- I'm sorry. I'm going to make you switch books back to R-2, the permit.

A Okay.

Q On Page -- let's see. Yeah. Page 21, which would be the same on the PDF.

A Okay.

Q So did you see the bottom of Page 21 there, Section 4, where it says, "Double Cropping, Winter Cover Crops, and

Perennial Crops"?
A Yeah.
Q That bottom section there?
A Yeah. Actually, it's towards the top, but I want to make sure we're at the same place. Section 4. Right?
Q Yep. That's the one.
A Okay. Gotcha.
Q And it's -- in reading this condition of the permit, it talks about land applications taking place after fall soil sampling must be demonstrated to be necessary with regard to the amount of nutrients that may be added.

So what it says in the second paragraph where it starts, "Before land application may take place for a double crop, winter crop -- cover crop or perennial crop, the permittee must have taken fall soil samples, have had the soil samples analyzed, and developed a second yearly field nutrient budget."
A I see that.
Q Does that seem to address your concerns that the permit does not permit the use of double cropping or perennial crops?
A In conjunction with Table 3, it does help.
Q Mm-hm. Because your earlier testimony seemed to indicate that you didn't think the permit accommodated.
A If you look at Table 3 only, it could lead one to believe

that it's fairly restrictive or -- and I guess the other thing is that, you know, when we have the term "high," usually indicates bad.

Q Mm-hm.

A And it might be okay, and I think that's why the language in the fall soil nitrate bulletin stayed away from terms like low, medium, high, very high, and that they're just management categories.

Q Well, and that's what these are, correct, just management categories?

A Correct.

Q Because it doesn't -- you know, under certain management categories and conditions, certain things have to happen?

A And I think I've heard them mentioned as targets before, yeah.

Q Okay. Thank you.

Could I ask you to take a look at -- let's see -- I-45, please.

A Okay.

Q So do you recognize this document?

A Yeah. So it's an email from me to John Jennings, copied to Andy Bary, Dan Wood, and WSDF.

Q And it appears to have some attachments, and the body of the email says, "Attached comments on the current draft version of the CAFO permit"?

A Yes.
Q And the date there, July 2016?
A Yep.
Q Could you please turn to Page 12. In our PDF it's Page 12. I know the -- you go past the paper that we just discussed.
A Yeah.
Q And then here's where I think actually your comments begin.
A Okay.
Q So down toward the bottom of the page there where you're commenting, I believe, on Page 20 and Section F -- and I'll just go ahead and read that -- "When crop nutrient utilization has stopped or is limited, e.g., no application to perennial grass crops before spring green-up. The term 'spring green-up' leaves a lot of room for interpretation and suggest changing to the use of T-sum 200 concept of applying manure when sufficient heating has occurred."

Can you tell us what T-sum 200 is?
A T-sum 200 is the sum of temperature that would -- starting January 1 of each year, that would be productively used for crop growth.
Q Was that what you were talking about when we were talking about spring samples a moment ago, where the crop was

beginning to grow, maybe the green-up idea and you were saying that the temperature in the soil --

A Yeah. That would be -- yes.

Q Okay. And is it your understanding that the permit now does include T-sum 200 as a -- as a tool?

A Yes.

Q With regard to --

A Yes.

Q -- nitrogen application?

MS. BARNEY: Thank you. That's all I have.

JUDGE FRANCKS: Okay. Mr. Tebbutt?

MS. BARNEY: Oh, Your Honor, I'm sorry. I neglected to move to enter Exhibits I-51 and I-45.

JUDGE FRANCKS: Okay. I-51 and I-45 are admitted.

(Exhibit Nos. I-51 and I-45 admitted.)

MS. BARNEY: Thank you.

JUDGE FRANCKS: Mr. Tebbutt.

CROSS-EXAMINATION

BY MR. TEBBUTT:

Q Good morning, Dr. Harrison.

A Good morning.

Q I think I was the one who took your testimony about 12 years ago in front of this agency; correct?
A I think that's correct.
Q Actually, didn't take your testimony. I cross-examined you; right?
A Correct.
Q Now you're a public employee; right?
A Pardon?
Q You're a public employee?
A Yes.
Q And you're here on the public taxpayers' dollar; correct?
A Yes.
Q And you've been an agent of the Washington State Dairy Federation for about 33 years; correct?

MS. NICHOLSON: Objection. Terminology is incorrect. Assuming facts not in evidence.

MR. TEBBUTT: It's a valid question.

JUDGE FRANCKS: All right. I'm going to allow it.

A I don't understand the question.
Q (By Mr. Tebbutt) You've been representing the dairy federation for 33 years, or 35 years now, I think, as you testified today in your work as a public employee; correct?

MS. NICHOLSON: Objection. That misstates testimony.

JUDGE FRANCKS: Can you rephrase the question?

Q (By Mr. Tebbutt) How many meetings of the dairy federation have you attended in your time as a public servant?

A So thinking back to my deposition, I think I -- over a period of 20 years, I think I came up with a number, something like 80.

Q It's actually 33 years; right?

A Well, I didn't attend their meetings for the first portion of my career because it was another faculty member that served that role.

Q Okay. So you do -- you've done it for the last 20 years at about five times a year?

A Approximately.

Q So about 100 meetings of the dairy federation, right, on their behalf?

A Incorrect.

Q Incorrect?

A Mm-hm.

Q What's incorrect about it?

A My role is a liaison between Washington State University, particularly college of agriculture, home and economics,

economic resources.

So it's to serve as a liaison role between the university and the dairy industry specifically as it relates to this meeting of the dairy federation.

Q So it's not then to be an expert witness on behalf of the dairy federation for nothing; right?

MS. NICHOLSON: Objection. Argumentative.

JUDGE FRANCKS: I'm going to sustain that.

Q (By Mr. Tebbutt) So you do your work for nothing for the dairy federation?

MS. NICHOLSON: Objection. Argumentative.

JUDGE FRANCKS: I'm going to sustain that.

Q (By Mr. Tebbutt) You don't charge the dairy federation for any of the work that you do for them; correct?

MS. NICHOLSON: Objection. That misstates his testimony.

JUDGE FRANCKS: I'm going to allow him to answer that question.

A Question again, please.

MR. TEBBUTT: Would the court reporter please read it back so Mr. Harrison can actually answer a

question.

(Question on Page 1176, Lines 17 through 18, read by the reporter.)

A Correct. They fund research.

Q (By Mr. Tebbutt) That's all I asked. Just correct or not correct.

And they do fund your research too, right, oftentimes?

A First question was, do they fund it? Yes. Oftentimes? No.

Q Sir, you're not a soil scientist by education; correct?

A Correct.

Q You're not a hydrogeologist?

A Correct.

Q You're not an agronomist?

A Correct.

Q You're not an economist?

A Correct.

Q Let's take a look at R-15, please. Take a look at the PDF Page 13.

Do you have that in front of you, sir?

A Getting there. Hang on. Okay.

Q Would you read the very last paragraph?

Well, let me ask you: You're a coauthor of this

study; correct?
A Correct.
Q Okay. Read the very last paragraph on that page, please.
A "Model results based on measured field parameters indicate an average of 115 pounds breaker of nitrate leached to groundwater from September through March. Two methods for estimating the nitrogen residual at the end of the growing season, mass balance analysis and post harvest soil nitrate testing, were not reliable predictors of nitrate concentrations in groundwater. Direct monitoring of water quality at the water table was the only accurate and reliable method for tracking effects of manure management on groundwater nitrate."
Q Thank you.
Now let's take a look at A-59.
A So which book is that in?
Q It's in the A book, which is ours, the white cover, the large --
A Okay.
Q You have that in front of you?
A Yes.
Q And that's PowerPoint that was done, extracting information from R-14 -- R-15, sorry, that you were coauthor of; correct?
A Correct.

Q Let's take a look at Page 9 of A-59. You have that in front of you? The page entitled "Results," A-59, Page 9.
A Yep. Got it.
Q See that in the bottom right? Should have the label.
A Yeah.
Q Read the first two bullet points, please.
A "Groundwater nitrate concentration highest first winter. Maximum of 45 after high manure nitrogen line."
Q Okay. Read the second one, please.
A "Groundwater nitrate decreased with lower nutrient manure nitrogen loading below the MCL 2006 to 2007."
Q Right. So when you apply 45 parts per million, the results indicate that if you apply 45 parts per million of nitrogen, that you get high nitrate concentrations in groundwater; correct?
MS. NICHOLSON: Objection. Assumes facts not in evidence.
A That's incorrect. That's not what it says.
Q (By Mr. Tebbutt) All right. Let's take a look at the next page, Page 10.
A Okay.
Q There are two methods for estimating manure nitrogen loading effects on groundwater ; right?
A That's what this page summarizes.
Q Right. And the first one says, N mass balance inputs

minus outputs equals excess N to groundwater; correct?
A That's -- agree with what's written there.
Q Right. So that's what you're talking about when you say that groundwater -- or nitrates at the end of the application season flush to groundwater over the course of the winter; correct?
MS. NICHOLSON: Objection. That misstates testimony.
JUDGE FRANCKS: Can you rephrase?
Q (By Mr. Tebbutt) Earlier you talked about nitrate being lost to groundwater over the course of the winter; correct?
A Yes.
Q And this is the equation that shows how much nitrate goes to groundwater; right?
A No.
Q No? What does excess N to groundwater mean there then?
A Potential movement to groundwater.
Q Okay. Take a look at Page 12 of A-59.
A Same document?
Q Yeah. Same document.
A Okay.
Q Do you have that Page 12 in front of you?
A I do.
Q And would you read the second bullet point, please.

A "Soil dynamic system, high variability, high recharge over the fall/winter, post-harvest soil nitrate test inherently estimate the amount" --
Q Sir, do what? Soil inherently what?
A "Underestimate the amount of leaching to groundwater, Kowalenko 1987 and Kuipers 2014."
Q Right. And then take a look at Page 16 of A-59.
A Okay.
Q So this study talked about how much nitrate leached to groundwater during fall/winter period; right? That's the first bullet point?
A It was some modeling work that they did.
Q It wasn't actual monitoring -- groundwater monitoring?
A This particular page refers to modeling work they did.
Q But that was based on actual groundwater monitoring too; right?
MS. NICHOLSON: Objection. Please allow him to finish the question -- his answer.
JUDGE FRANCKS: Were you finished with your answer to the last one?
A Not sure.
Q (By Mr. Tebbutt) Let me just ask the question again.
A Okay.
Q This first bullet point, what you're discussing here -- you're talking about the modeling -- it actually included

actual groundwater monitoring; correct?
A Yeah. It was actually Barb Carey that was actually discussing this.
Q That was not my question. My question was: Did it include groundwater monitoring?
Answer the question, please.
A Yes.
Q And 40 percent of the leaching occurred after the fall flush; right?
A The model predicted that.
Q Right. So let's take a look at page A-17, please -- or A-59, Page 17. Same document. The second bullet point talks about only sample the top foot.
So if you don't -- you see that there?
A Yes.
Q And so if you only sample the top foot, you don't know what's going on in the second and third and fourth foot, right, in terms of nitrate movement?
A If you only measure the top foot, that's all you know.
Q Right. But the nitrate -- you agree that the nitrate moves with the water down into the -- towards the groundwater; correct?
A It can.
Q It's more likely than not that it does; correct?
A No.

Q It's not more likely than not that it does.
So what else could stop it? Uptake by plants?
A Uptake by plants, correct.
Q And that's the only thing that would stop it; right?
A No.
Q Under normal conditions?
A No.
Q What else would stop it?
A You can actually have soil conditions or the chemistry in the soil particularly as it relates to iron compounds which can hold the nitrate at levels within the soil profile.
Q Have you seen that in the state of Washington very much?
A I have seen long ditch lines where you'll see a lot of iron contribution to drainage in the ditch, so, yeah, it's evident that happens in Washington.
Q Can you point to any studies that show that? Can't, can you?
MS. NICHOLSON: Objection. He's not allowing him to even answer the question.
JUDGE FRANCKS: I'm going to sustain that.
Q (By Mr. Tebbutt) Let me rephrase it.
You can't point to any studies in the state of Washington that show that condition as taking out the

nitrate in the water -- in the soil column, can you?
A Not that I can recollect.
Q Right. Take a look at Page 18, please.
A Okay.
Q Read the last three bullet points, please.
A "Applying manure too late in the season resulted in groundwater nitrate increases."
Q That's first one. Read the second one, please.
A "Nitrate continued to leach in the late winter/early spring."
Q Okay. Third one?
A And "Groundwater monitoring was the only reliable way to assess nitrate impacts."
Q Okay. Let's take a look at Page 19, please, of A-59. In the acknowledgments, you said the Lynden, Washington, dairy producer/landowner contributed their place for this work?
A Correct.
Q Who was that?
A Larry DeHaan.
Q And where is that facility in Lynden?
A It's northwest of Lynden.

MR. TEBBUTT: Yeah. Move to admit A-59.

JUDGE FRANCKS: A-59 is admitted.

(Exhibit No. A-59 admitted.)

Q (By Mr. Tebbutt) Let's take a look at R-12, please. This is the Sullivan and Cogger study that's been talked about quite a bit in this hearing; correct?

A Yeah. It's not a study, but, yes, it's a Sullivan/Cogger guidance bulletin.

Q Okay. Let me just back up for a minute.

Sir, you've been present for all of this hearing; correct?

A Except for the first day.

Q Okay. And, again, you're being paid by the taxpayers to be here; correct?

MS. NICHOLSON: Objection. Argumentative.

JUDGE FRANCKS: I'm going to sustain that.

MR. TEBBUTT: I guess we've already established it already.

Q (By Mr. Tebbutt) Take a look at Page 3 of R-12, please.

A Okay.

Q And specifically this page discusses the continued mineralization can provide enough plant available and for a crop; correct?

MS. NICHOLSON: Objection. Vague.

JUDGE FRANCKS: I'm going to overrule

that, but I would like to know where it says that.
A Yeah.
Q (By Mr. Tebbutt) It's where -- on the --
A Left column? Right column?
Q Right column under "how not to use" -- the first bullet point, "So continued mineralization" -- you see there -- "of nitrogen conversion of organic end forms to plant available end forms in the soil can provide enough plant-available nitrogen for a crop without accumulation of nitrate end in the soil."
Do you see that?
A I do.
Q You don't disagree with that statement, do you?
A No.
Q Let's take a look at Page 7. And this says, "Even where" -- looking at the "if post harvest nitrate end is 20 to 45 parts per million part."
Do you see that?
A The upper part, yes.
Q It says, "When residuals post harvest nitrate is that you should still plan to reduce manure application by 10 to 25 percent"; correct?
A That's what it says, yes.
Q Yeah. So this study deals, again, more with plant issues than groundwater contamination; right?

A Yeah. The context of this bulletin was from an agronomic standpoint for crop growth, correct.
Q Right. It's not about protection of groundwater, is it?
A I think, in the beginning of the bulletin, they address the -- it's not meant to be a regulatory document.
Q Okay. Sir, can't too much nitrogen in a forage crop actually hurt the animals?
A Yes.
Q And that's discussed on Page 14 of R-12, isn't it? If we could go to Page 14, very last bolded paragraph.
A Correct.
Q Let me ask you about triticale.

After you harvest corn and planting triticale on the east side --

A Okay.
Q -- how far down does the triticale root system establish itself in the fall in that first planting?
A Well, it's only planted once.
Q Right.
A Exact root depth, I can't give you an exact number.
Q Less than a foot, though, isn't it, when it's established in the fall?
A I can't give you an exact number.
Q Haven't you ever looked at it?

MS. NICHOLSON: Objection.

Argumentative.

JUDGE FRANCKS: I'll allow it.

Q (By Mr. Tebbutt) It's a simple question.

A In Eastern Washington, no, I haven't.

Q So you don't know how deep the roots are on it; right?

A I don't have an exact number.

Q And if nitrate goes below the root zone, it's destined to go to groundwater, more likely than not, right, in Eastern Washington?

MS. NICHOLSON: Objection. Misstates testimony.

JUDGE FRANCKS: I'm going to allow him to answer it.

A No.

Q (By Mr. Tebbutt) Can you answer the question, please?

A I did.

Q I'm sorry. What was your answer?

A No.

Q No. Where does it go? Just sits there?

A It can.

Q But if there is more irrigation practices, that water will move the nitrate to groundwater, won't it?

A Producers aren't irrigating over the winter.

Q Okay. Precipitation will move that nitrate down to groundwater, won't it?

A It may move the nitrate.
Q More likely than not that it will, isn't it?
A No.
Q Really? In your opinion -- you've heard Mr. Erickson testify about that; correct?
A Yes.
Q And you disagree with his testimony about that?
A Yes.
Q And so you didn't get out and study the soils in Eastern Washington at any of the dairies, did you?
MS. NICHOLSON: Objection. Misstates testimony.
A Done a case study with one of the dairies in Eastern Washington that relates to their manure cropping practices in a corn and triticale production system and produced a video with interviews of their consultants, fertilizer consultants, as well as the producer and his land application people.
So from that standpoint, I have studied it. I didn't actually take the samples myself. But in the context of producing our professional video, yes, we did evaluate it.
Q (By Mr. Tebbutt) Was that for the GWMA?
A Was that for the GWMA? No. It was actually a part of climate change research project.

Q And when was that done?
A I believe two summers ago.
Q Were those results submitted to the GWMA?
A No.
Q Did it show nitrogen below the one-foot significant or --
A I'd have to go back and look at the video to --
Q How did you do the test?
A Again, I can't answer that specifically today.
Q But none of that is mentioned in your expert report; right?
A No.

MR. TEBBUTT: Your Honor, would this be a good time for a break? I have a few more questions.

JUDGE FRANCKS: It is a good time for a break. Let's take a ten-minute break. We'll be back at 10:46.

(Pause in the proceedings.)

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

Mr. Tebbutt -- oh, we need a witness, don't we?

MR. TEBBUTT: Well, I don't know. In this particular case, I'm not sure.

MS. NICHOLSON: He's in the restroom, Your Honor.

JUDGE FRANCKS: It's okay. He's been

in the hot seat for a while.

Let's go back on the record. Mr. Tebbutt.

CROSS-EXAMINATION (Continuing)

BY MR. TEBBUTT:

Q Yes. I have a few more questions, Dr. Harrison.

A Okay.

Q You testified about 1998 Dairy Nutrient Management Act earlier in your questioning from your lawyer; right?

A Correct.

Q And so you were involved in that on behalf of the dairy federation?

A No.

Q Why were you testifying about it then?

MS. NICHOLSON: Objection. Argumentative.

JUDGE FRANCKS: I'll let him answer.

A To provide an understanding of the current conditions for all dairies in the state with regard to conditions that are fairly similar to what's in the proposed permit.

Q (By Mr. Tebbutt) Didn't, in fact, the industry run to the legislature to propose the Dairy Nutrient Management Act to cover their tracks when CARE sued a bunch of the dairies in 1997 and 1998?

MS. HOWARD: Objection. Argumentative.

A I don't know.

JUDGE FRANCKS: I'm going to allow him to answer.

A I don't know.

Q (By Mr. Tebbutt) Okay. So what methods are there for tracking effects of manure management of groundwater?

A Not sure I understand the question.

Q All right. Let me ask it again. What methods are there for tracking effects of manure management on a groundwater nitrate impacts?

A If a person is interested in actually looking at groundwater nitrate, one has to sample groundwater.

Q Right. That's the only way to know; right?

A It's the only way to know what the nitrate is in groundwater is to actually sample the groundwater and have it assayed.

Q You were asked some questions about I-49, which was your little graphic about the nitrogen cycle; right?

A Correct.

Q And you pointed out in the testimony that you missed the leaching to groundwater as part of that; right?

A I indicated there was an arrow that should be in the drawing to indicate movement of nitrate.

Q Right. And so you left that out intentionally because you didn't want to show the flushing to groundwater, did

you?

MS. NICHOLSON: Objection. Argumentative.

JUDGE FRANCKS: I'm going to sustain that one.

Q (By Mr. Tebbutt) Did you leave it out intentionally?

A Nope.

Q The Baram study actually showed that the dairy was contaminating the aquifer, didn't it?

A That's my understanding.

Q Sir, if tile drains are present in a field, don't they provide a direct conduit for manure to be discharged to surface waters?

MS. NICHOLSON: Objection. This is outside of the direct testimony.

JUDGE FRANCKS: I'm going to sustain that. We didn't talk about tile drains.

MR. TEBBUTT: Well, he talked about everything that wasn't in his expert report. Surface well, monitoring.

JUDGE FRANCKS: He didn't talk about tile drains.

Q (By Mr. Tebbutt) Did you talk anything about surface water monitoring in your direct?

MS. NICHOLSON: Objection.

Argumentative.

JUDGE FRANCKS: I'm going to sustain that too.

Q (By Mr. Tebbutt) Are there multiple ways that dairy can contaminate the environment? Correct?

MS. NICHOLSON: Objection. Argumentative.

JUDGE FRANCKS: I'm going to allow him to answer.

A Correct.

Q (By Mr. Tebbutt) And one way would be through surface water discharges; correct?

MS. NICHOLSON: Again, Your Honor, this is outside the scope of direct.

A That's what the CAFO permit is about.

JUDGE FRANCKS: I'm going to allow it.

Q (By Mr. Tebbutt) And so if you overapply manure to soil, it could run off to surface water through either sheet flow or through percolation down to groundwater that's hydrologically connected to surface water; correct?

A The possibility exists.

Q And one of those ways would be through tile drains; correct?

MS. NICHOLSON: Objection, Your Honor. Getting back outside the scope of the direct testimony

again.

JUDGE FRANCKS: I'm going to sustain that.

Q (By Mr. Tebbutt) Sir, you've done a lot of work to study the impacts of manure management with regard to dairies; correct?

A Correct.

Q You've done any studies on the impact of nitrate contamination on people, using taxpayer dollars?

A Not that I remember.

Q I didn't think so.

JUDGE FRANCKS: Redirect?

MS. NICHOLSON: Yes. I just have a few things, Dr. Harrison.

REDIRECT EXAMINATION

BY MS. NICHOLSON:

Q Could we -- can we start with Exhibit R-12. And I believe that counsel for Puget Soundkeeper directed you to Page 3.

A Okay.

Q And on that page, he asked you to read a paragraph, I believe, under what the test will not do.

Do you recall that?

A Yes.

Q And it says that, "The continual mineralization could

provide enough plant available nitrogen for a crop."
Isn't that what it says?
A Correct.
Q Wouldn't that be entirely dependent on the crop you were growing?
A Yes, it would. So different crops would require different amounts of nitrate nitrogen.
Q Can I have you turn to -- turn to A-59, please.
A Okay.
Q Can you tell me what this is?
A This was a PowerPoint. It was developed by Barb Carey from the Department of Ecology for presentations she made at the groundwater protection council annual forum in Seattle in October of 2014.
Q And did you also present at that forum?
A No. I was not an attendee.
Q And did you draft this presentation?
A No. My name is on it. And that's common courtesy in a professional situation like this, to recognize those that are involved.
Q And do you agree with all the conclusions that you see reflected in this PowerPoint?
A Not necessarily.
Q And let me -- one second here. I believe counsel directed you to Page 9 of the -- and do you recall being

directed to this page?
A Yes.
Q And he asked you about application of 45 parts per million?
A Right.
Q Was there any application of 45 parts per million?
A Yeah, the reference of 45 has to do with the groundwater. It doesn't refer to the application rate of manure.
Q So was -- so, to your knowledge, there was no application of manure at 45 parts per million?
A Yeah, I'd have to go back through and look at the data to see exactly what the -- what the level was, but the max 45 refers to groundwater.
Q Okay.
A I think the other thing that's important to understand about this presentation is that one of the interests on the part of Department of Ecology was to do modeling work to try to take portions of data from the study and see how predictive it was. These studies are really expensive to run, and particularly if you look over many years of time.

And so, you know, one of the conclusions comes from this, we weren't able to predict while there was a lot data collected and it was over a significant amount of time, it would take a much more robust experiment where

you had very controlled application rates over multiple fields and replicants to really get a robust model to really be able to protect that groundwater nitrate.

So I think that that has a lot to do with conclusions that Barb was making in this particular presentation.

Q So it's more of a modeling question than a --

A This presentation definitely was in the context of modeling.

Q Okay. And, again, that was a study that was not controlled. You were just recording the effects of this study?

A Correct.

Q Okay. I can get you to turn to Page 12. I believe counsel had you read the second bullet point over in the box to the right of the graph.

A Yes.

Q Do you agree with that second bullet point?

A In the context of the modeling work, it's -- it would be a true statement.

And then she gives references to a couple other authors, both out of, I think, British Columbia. I know Kowalenko is for sure.

Q So that's only in context of the modeling part of the study; is that correct?

A That's my understanding.
Q Okay. But do you necessarily know what conclusions Barb Carey was coming to in this PowerPoint? Did you discuss it with her at all?
A Not ahead of time, no.
Q And do you agree with all the take-home messages that are shown on Page 18?
A Okay. So, again, in the context I -- of the modeling, in realizing it's a small portion of the overall data, Bullet Point No. 1, again, limited data within the allowed field nitrogen mass balance to correlate, intensive soil nitrate data, higher availability test leaching.

There were times where I guess it was a crop uptake data that actually was able to correlate but not necessarily the intensive nitrate data.

The model, again, we talked about how it didn't work.

Bullet Point No. 2, 3, 5, 6, "applied manure too late in the season resulting in groundwater" -- that, I definitely agree with. Clearly show that one of the lessons learned.

We did continue to see nitrate leach in the late winter, early spring. That was evident in the groundwater -- shallow groundwater sampling, not the deep

water.

And, again, in the context of, if you're going to look at groundwater and you want to know what the nitrate content is, the only way you can know it is to sample it.

So couple of bullet points, I do; the other ones, I qualify.

Q I'm sorry. I missed what you just said.

A A couple of bullet points I agree with, but many of them, I would have to qualify a disagreement.

Q And back to the study, which you did help author?

A Correct.

Q That reflects your actual opinions?

A Yes.

Q Regarding this data?

A Yes.

Q I want to ask you a little bit about your background.

You testified that you're not an agronomist by training.

Are you an agronomist by experience?

A So I've had to learn a lot about agronomy, soils, a lot of other aspects. And I do that in working with colleagues that are trained in those areas, so we tend to work as teams.

So I picked up a lot of, I guess, on-the-job training, and I've gone to agronomy meetings as a part of

my professional attendance at national meetings as well.
Q And I believe you testified earlier this morning that you work with research teams with other professionals?
A Correct.
Q And one of those areas is agronomy? One of those areas are --
A Agronomy and soils in particular and then agricultural engineers.
Q And so you work as a team to come up with practical solutions; is that correct?
A Correct.
Q So back to Table 3, just very quickly --
A Okay.
Q -- does this table reflect normal nitrogen when double cropping -- in other words, if you are double cropping in the state of Washington?
A Right.
Q Does this table reflect what you would need to do for double cropping?
MR. TEBBUTT: Objection. Leading.
JUDGE FRANCKS: Can you rephrase?
MS. NICHOLSON: I will try.
A So -- I'll wait for you to rephrase.
Q (By Ms. Nicholson) Yeah. Wait for me rephrase because I'm going to try that again.

What I'm trying to get at is, this table reflects what is necessary actions to take when you get a certain fall soil nitrate test parts per million; is that correct?

MR. TEBBUTT: Objection. Leading.

JUDGE FRANCKS: I'm going to allow it.

A That's my understanding.

Q (By Ms. Nicholson) And is the required actions that you were required to take based on that fall soil nitrate, does it reflect the different cropping methods of double cropping or using the cover crop?

A In the table, it's not clear. I guess if under the second bullet point -- let me see here.

And that's the part that I guess I've always been concerned about permit language is that it's sometimes difficult to know where you are.

So I guess here where it says, "Hire a professional consult to develop a yearly budgets and application rates," one might -- and if you take into consideration other pieces of the permit.

But as a standalone table, if this is the driver of your actions, it's not clear to me that you have the leeway to go ahead and build those second budgets and take into consideration that second crop.

Q And if it's not clear to you --

MR. TEBBUTT: Your Honor, I'm going to object. This is outside the scope of the cross.

MS. NICHOLSON: No, it's not. That's incorrect. Ecology brought this up, Your Honor.

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

Q (By Ms. Nicholson) So if Table 3 is what directs your actions, what is the impact to producers of trying to follow this Table 3?

A Well, if the -- if you had to use this as a standalone to redirect -- or to make adaptive management, for instance, we discussed the fact these little nitrates would be reasonable to be used for crop triticale production or it would be reasonable that those kind of levels would be appropriate for grass fields at that time of the year.

So these kind of actions, asking you to apply less, would result in lower yields of either triticale or grass. They wouldn't be managed to their higher level productivity.

Q And that would, in turn, make them less protective of groundwater?

A In my opinion, yes.

Q Okay. Thank you.

You were asked by Ecology about sampling beneath lagoons regarding the question of viruses.

A Correct.
Q Would you -- in your opinion, would you need to sample beneath a lagoon regarding a virus?
A Well, depends on the interest of the study. As it relates to viruses of human concern from cattle, no, you would not.
Q And that's simply because they don't transfer?
A Correct.
Q Thank you.
In the Sullivan and Cogger document, is planting a cover or a double crop an alternative to reducing land application of nutrients?
A So when that bulletin was written, cover cropping wasn't a real routine practice. So it's really not really written into that bulletin, the fall soil nitrate bulletin.
Q So what is it?
A Well, the double cropping isn't really considered as a way that those guidelines were originally written.
Q Because double cropping wasn't a --
A Wasn't a common practice at that point in time. It's only been during the last technically ten years, but going on fifteen.
MS. NICHOLSON: I believe that's it, Your Honor.

JUDGE FRANCKS: Okay. Board questions?

MR. TEBBUTT: Your Honor, may I ask two questions?

JUDGE FRANCKS: No.

MR. TEBBUTT: Because there were --

JUDGE FRANCKS: We do redirect and then we do board questions. You can hope that the board members ask something that you're --

MR. TEBBUTT: The witness just brought up a brand-new issue about something that was outside prior testimony, and it's kind of an important issue about viruses and zoonotics and how they -- how viruses transfer to -- from animals to humans.

JUDGE FRANCKS: And we've already talked about that, and I've already ruled.

So board questions?

MS. MARCHIORO: I just had a couple questions.

EXAMINATION

BY MS. MARCHIORO:

Q So I'm just trying to understand, and I don't mean anyone to take this in the wrong way, but I'm trying to get a sense of the sophistication of the dairy farmers in terms of you're under a permit and either can't understand or

they can't understand it.

So have you worked with any dairies in trying to implement the prior NPDES permit?

A So my role -- starting back in around 2000, we -- a group of us worked on writing what we call a CAFO fact sheets.

And so, for instance, the CAFO fact sheet that I was a primary author -- was coauthor on a few, but the primary one I remember was the -- what's called ag stormwater exemption.

And so that one can be kind of tricky for people to understand, so I tried to get it in really simple language, give examples.

And so my primary audience as a faculty member of the university for the last three years has primarily been the advisors of producers.

And I do go to producer meetings and I do give some producer talks, but in this state and many states, whether it be nutritionists or agronomists or what we call technical service providers in the agronomic and soil area, we work with a lot of those advisors.

So even helping them understand, have those fact sheets available, which then they can work with their producers.

Q So that would include the local conservations districts?

A Yes. Yes.

Q And then in terms of -- so you got your fact sheets.

And does Ecology also produce fact sheets for these types of NPDES permits?

A There is an interpretive guide -- I don't know the exact name of it, but I did look it up on the Web -- that does provide some guidance for that.

It's not as extensive as what we did, say, back in early 2000s with those fact sheets.

The other educational tool that we've had is the conservation districts have an annual meeting that they hold in Leavenworth every year, and so I've been involved in a number of programs as a speaker to, again, try to help interpret a lot of these regulatory issues.

Q And are you familiar with the requirements -- statutory requirements for technical assistance to be provided to individuals under a permit or regulation by Ecology?

A Yes.

Q Okay. So that's available here too; correct?

A Yes.

Q So any concern that you've expressed about this table -- just trying to understand.

You have some concerns about it, but it doesn't mean it's not -- I understand your concerns and whether you think it's going to --

A Yeah.

Q -- but doesn't mean it's not necessarily implementable. It's just a matter of making certain that the agricultural operator knows where the limits are and does the test?

A Yeah. We want to get it implemented in a way that's not confusing, and, therefore, they would not subsequently be meeting the intent of the permit and then could be subject to penalties or other things, so, yeah.

Q Okay.

A Clarity is good.

Q And just trying to understand, NPDES permits, state waste discharge permits, they're issued in a five-year cycle; right? They try to do that?

A That's the intent, yep.

Q So you were asked some questions about the last time this particular permit, the singular one, was before the board.

And my experience with NPDES permits is, there's an attempt to evolve them over time, improve and do things like that.

What changes has there been in the dairy industry since the last time this CAFO permit was issued that you can articulate as the -- has the industry evolved or is it just this permit is now sort of bringing it up to standards that were even maybe a little bit too far of a

reach last time the permit was issued?

A Well, I think that, again, I mentioned this earlier, probably didn't stick very well, but much of what is in this permit, not everything, but much of what's in this permit is already required by all the dairies in the state.

Now, there's permits for more than just dairies. It could be for beef cattle or other livestock facilities. So it's -- while we're here talking about dairy, it has broader -- a broader sweep than just dairy in the state, so it could be for beef.

So changes within industry, we've seen operations get larger and so their staff become more sophisticated.

So we have people that are really designated towards the manure management aspect, towards CAFO growing, towards cropping.

And so we see people that are dedicated to those rather than having -- wearing multiple hats all in the same day. So I think there's a sophistication from that standpoint in the industry.

Certainly technologies out there are available for managing manure, whether it be the land application side of it or the ability to separate out nutrients and separate out the large fractions of solids so that lagoons are more easily managed.

Those are all areas that technology has advanced in, and we've got dairy tech company in Northwest Washington and Lynden become actually nationally known for their innovative technology for manure management, so --

Q And when did the federal government issue -- EPA issue the first CAFO permit? Are you aware?

A You know, I just looked at that PowerPoint the other night. So I -- there's, I think, a 1948 act of some sort that related to water, and there's another, 1972.

And then I believe it was couple decades later then they were sued, that they weren't updating their permit frequently enough. So then they started to go in these five-year cycles, so I think that was as a result of the five-year cycles.

MS. MARCHIORO: I can't remember the last one. Thank you.

JUDGE FRANCKS: Ms. Brown.

EXAMINATION

BY MS. BROWN:

Q Yeah. So I just had a few questions here. You mentioned early on in your testimony something about technology that can measure seepage from manure lagoon --

A Yes.

Q -- or there's a couple of kinds of those.

A Correct.

Q Could you explain a little bit about those.
A Okay. So through the Conservation Innovation Grant program within NRCS, they funded some research. And I think a lot of the work was done in Michigan, but essentially what you'll have is a system that floats on top of the lagoon.

And the idea is that you do these measurements when there's no inflow or outflow of the manure lagoons. So what they typically do is, they suggest you do it from the late evening until the next morning where you don't flush your dairies. You don't have any manure movement into or out of that lagoon.

So it's a system that floats on the surface, and it measures very small because it's a pretty small movement.

And then there's also a system that measures the evaporation transportation, the ET, that would occur at the same time.

And so with that equipment, then, they'll have it on the lagoon for, say, eight to ten hours. It would be desirable to have it longer than that, but the dairies need to function, and they need to keep managing manure, so that's why they use it on an eight-hour basis.

That particular equipment has been used in our state once already, and it's available through the State and NRCS office on request.

The second technology is one that's called a resistance array, and essentially you think of it as a series of rods which would be pushed down alongside the lagoon bank and towards the bottom of the lagoon.

And then there's electrical conductivity runs through that, and when that resistance changes, that's an indication there's seepage.

And then what you would have to do is go in and do sampling then to determine what that -- and that technology is under demonstration right now on one new lagoon that was built a year ago and one existing lagoon, both of those in Eastern Washington.

So the data is being collected, as we're sitting here, and I spoke with a faculty member about that a few weeks ago.

And he said at this point they aren't seeing any -- they aren't seeing any changes in conductivity, so time will tell, be multiyear project.

Q How accurate are those measurements?

A So obviously, when we're talking about these ten to the six, ten to the seventh, and all the units and so forth, it's a small amount, and so we're looking at a small difference in a lagoon.

The engineers developed it and have done the beta testing and now released it for routine use, so feel that

the accuracy is there.

Q Within the scale that it needs to be to detect leaking?

A Correct.

Q Okay. And how expensive are they?

A So when we -- we hit that limit about two years ago, and I knew that question was going to come up with the webinar audience, so I kind of pushed them.

And it was in the early release of it, and at that time they seemed to indicate it was about $10,000 an evaluation.

Q For either system or --

A That -- I was just going to say, the array, I'm not sure. I have not been personally involved in that system, so -- and I didn't ask recently, but that would be, I'm sure, more expensive system to install.

Q So the cost is sort of comparable to the liners to non --

A Oh, much less expense -- so if you hit a $10,000 seepage test, which you could. I mean, we're -- the numbers -- when I -- when I put the numbers together by doing case studies with dairies that had installed these liners, the numbers ranged from 40,000 to 600- to 700,000, depending on how many lagoons and how many cows you had and how much dirt work is done to retrofit and that whole piece of it.

Actually, those numbers weren't part of the

estimate. They were from materials and for installation of the new, but if you had to go in and actually do all the dirt work and engineering to prepare to do it, that one is a real unknown.

And it's almost a, you know, farm by farm. So those original numbers of say 40- to 600,000 were underestimates of true total cost.

Q Okay. Thank you. That's helpful.

You said something just -- I just didn't understand. I was wondering. You said something about aeration of soil, reason that we're moving toward no tilling.

A Yeah. So one of the things that -- there's -- so running tractors over fields is expensive obviously. So less time you can run your tractor over the field, the better off you are from a fuel standpoint and maintenance and wear and tear of equipment.

But the other thing is that, when you completely till soil, so you plow it, you disc it, you rotivate it, you till it, all that breaks up a lot of that soil organic matter, and then it converts from an organic nitrogen source over to nitrate.

So if we can avoid some of that -- and we've done a little bit of that work both at that -- the Whatcom study with -- the Carey study we've talked about a bit, and we've done it on some fields. It's been tricky. We tend

to have cool soils here in the Northwest, particularly in Western Washington.

And so doing minimal tillage, you have to have the right soil temperature and the right moisture conditions to make it work, so -- and the right soil type.

So it's not for everybody, but there is some options there to minimize breakdown of that organic nitrogen into nitrate.

Q Okay. And my last question: I'm just trying to understand your position or your thoughts, I guess is a better way to say it, about groundwater monitoring.

A Yeah.

Q Because I believe you said that you don't think it's necessary for the CAFO permit, but, on the other hand, you said it's the only way to accurately know nitrates into groundwater?

A Right.

Q So can you explain that a little bit more to me, please.

A So let's start with -- if you want to know what nitrate is in this glass of water, you've got to send it off to the lab. Okay. There isn't anything else that's going to predict it.

You could say that you're -- if they do a quarterly, your quarterly report from your water company says, "Here is what our recent estimates were, and so, you know, the

water a week from now should be clean."

But you aren't going to know it's clean a week from now unless you sample it. So it's that same sort of concept.

But are there indicators that -- practices, in this case, nutrient management plans or a permit, are -- have a set of conditions which would be protective of groundwater.

And I think that if we are collecting manure, we're storing it, and then we're land applying it at agronomic rates, that those practices, along with knowing some monitoring of how well are you doing with applying agronomic rates by doing soil tests, by doing crop tests, that those collectively, as a suite of practices, would be then protective of groundwater.

Does that help?

MS. BROWN: Yeah. That is helpful. Thank you.

JUDGE FRANCKS: Mr. Wise?

EXAMINATION

BY MR. WISE:

Q I just had a couple. Good morning, Dr. Harrison.

A Good morning.

Q I think you also said that you wouldn't recommend sampling in the spring for nitrates.

Can you explain that a little bit more.

A Yeah. On the west side. Because of the high rainfall we have here on the west side and the movement, utilization of the nitrate as well as movement, we -- when you soil sample, say, in February, particularly that February time period, the levels are low. So it's not worth the time and expense to find out that you've got a low level.

And we've repeatedly shown it and in experiments, and the field agronomists that work with producers will say the same thing. It's just not worth the time for what you could possibly gain from it, so --

Q Okay. Just had one dumb question.

What's triticale?

A Triticale is a hybrid grain. It's actually wheat and rye, in particular, combination of those two. And it's a very high yielding crop.

And typically what producers will do is, they'll harvest before it goes to grain. So it's a very highly digestible crop, and it does a really good job of taking up both nitrogen and phosphorous.

Some of the work that we did in Western Washington indicated that the nitrogen uptake could be -- over that winter growing period could be a very high percentage of what the corn crop would take up during its growing season.

So really good aggressive crop.

MR. WISE: Thank you.

JUDGE FRANCKS: Ms. Marchioro, did you remember your other question?

MS. MARCHIORO: Actually, I've been working towards a new one.

EXAMINATION

BY MS. MARCHIORO:

Q So in term of groundwater sampling and then you said the conditions -- you said it's conditions in the permit, but conditions on how people operate their CAFOs or dairies.

And I'm just trying to understand, if you then compare to what's been -- I forget what they referred to because I was gone last week -- the group -- the cluster dairies over there on the east side.

So I'm just trying to understand, what was the downfall there in their operations such that you had high nitrates in the aquifer?

A So --

Q If you know. I don't know if you --

A Yeah. So I guess I won't go as far as aquifer. I'll go as far as what's in the report that has been presented.

And that four-year data said -- it clearly shows there was large amounts of land application of manure, which resulted in high amounts of nitrogen in the soil.

And the groundwater wells that they have -- that they have at the dairy, the report clearly shows that there's a relationship between that soil nitrates -- this higher soil nitrate levels and this groundwater wells.

I won't go as far as -- go to the aquifer because I'm not a hydrogeologist or understand all that movement in that whole region.

Q Okay. I may have misused the scientific term, but in terms of -- so land application would be one.

Would it also -- I haven't read the report closely enough to know whether there was a relationship between the lagoon seepage. Do you recall?

A Yeah. I'm not a good one to ask on the lagoon seepage. I think experts have been up here on that piece.

Q Okay. And then in terms of a properly managed lagoon, how often would a properly managed lagoon be empty in a one-year period?

A There's -- lagoons ought to be empty at least once a year at minimum.

Q And then there are maintenance practices once they are -- there's no longer liquids in them to --

A They refill them, but I'm sure that they're doing a visual evaluation of them as they, you know, empty them.

Q But there's not -- is there a solids removal on a periodic basis? Annual basis?

A Well, that's one of the things that's -- with the technologies in solids, large particle solids removal, in particular, that the dairies are doing a much better job keeping those large particles out, which minimizes how much they have to go to lagoons.

And so with agitation, many of them are able to manage those to where there's very little solids in the bottom of those lagoons.

They don't have to actually go in with trackhoes or really sophisticated expensive equipment to move those solids out.

Q Okay. So in terms of -- let's say there's the milking parlor and you've got the -- taking all of the wash down, the milk where the cows have been, there's some process before to separate as opposed to letting it settle and there's a process before?

A Correct.

Q Okay.

A Actually run across what we call liquid solid separator and there's probably three primary types out of the industry that are currently being used.

Q Is that a common practice employed across -- from your experience, across CAFOs or dairies, small to large?

A Yeah, there is. In fact, I was involved in a research study a few years ago where there was -- one of the

primary things of interest was to know how much of the large particle solids were harvested in Eastern Washington.

And so we were looking at taking those solids and making a replacement for petroleum out of it with real high pressure systems and working with the Patel (phonetic) Labs in the Tri-Cities area.

Anyhow, so I worked with conservation district staff in Eastern Washington to say, "What percent of our dairies in that area as a geography were using some sort of liquid solid separation?"

And at that time, which was nearly 15 years ago, it was almost 100 percent of the dairies were doing separation.

Q And so then solids are put into piles to dry.

And how were they then used after --

A So they can -- typically, they'll compost them, and they can be exported off the farm. There's actually fairly high demand for those solids.

They can also be recycled as bedding for the animals. So those would be the two primary uses.

Q They're not -- but, like, the liquid, they're not necessarily put on the crops as compost?

A Not necessarily.

MS. MARCHIORO: Okay. Great. Thank

you.

JUDGE FRANCKS: Any other questions? Okay. Questions based on the board questions?

Ms. Barney?

MS. BARNEY: Nothing from Ecology.

MR. TEBBUTT: Of course I have a few.

FURTHER EXAMINATION

BY MR. TEBBUTT:

Q Again, you don't know if there are impacts to groundwater unless you actually test the groundwater; correct?

A Correct.

Q And you're familiar that both the Sumas-Blaine Aquifer and the Yakima Valley Aquifer have been contaminated above the maximum contaminant level for nitrates; correct?

MS. NICHOLSON: Objection. Assumes facts not in evidence and wasn't addressed in the testimony.

MR. TEBBUTT: We've been here for --

JUDGE FRANCKS: I'm going to grant the objection based on it wasn't one of the board questions.

So you're limited to what the board talked about.

MR. TEBBUTT: Well, there were questions about the technology to test the lagoon leakage, and that's directly related to all this, what

the whole hearing has been about.

So you're sustaining the objection?

JUDGE FRANCKS: Yes.

MR. TEBBUTT: All right.

Q (By Mr. Tebbutt) So you need to know what's left in the spring in order to know what the supposed agronomic application is in the springtime; correct?

A In Western Washington, I don't think that's necessary. In Eastern Washington, it's certainly common practice.

Q And the reason you don't -- you say you don't need it on the west side is because all the nitrates are already flushed through the soil into the groundwater; right?

MS. NICHOLSON: Objection. Misstates testimony.

JUDGE FRANCKS: Can you rephrase?

Q (By Mr. Tebbutt) Let me ask you this: The reason you don't -- you say you don't have to test in the spring is because the nitrates have already flushed through the system; correct?

A So the reason I say that there's not a need to test in the spring is, if you look at research studies which have evaluated the soil nitrates in the spring, there are -- they are at a low level.

And so amongst my opinion, in combination with my colleagues, is that it's not -- not a productive use of

time and money.

Q Right. But the Carey study that you did, that you did with Barb Carey indicated that nitrates flushed during the winter, didn't they -- didn't it?

A To shallow groundwater wells, yes.

MR. TEBBUTT: That's all I have.

JUDGE FRANCKS: Okay. Thank you very much, Dr. Harrison. You are excused.

Do you have another witness, Ms. Nicholson?

MS. NICHOLSON: I do. We're going to call David Haggith.

JUDGE FRANCKS: The court reporter will swear you in.

DAVID HAGGITH, having been first duly sworn by the Certified Court Reporter, testified as follows:

DIRECT EXAMINATION

BY MS. NICHOLSON:

Q Good morning.

A Good morning.

Q Can I have you first take a look at Exhibit I-3, please.

A Got it.

Q Okay. Can you tell me, is that your resume that you

submitted in this appeal?

A It is.

Q And can you give us a little bit after your educational background.

A I was born and raised in England. I always wanted to do farming, so when I graduated from high school, I went to Redding University in South Britain and took a degree in agriculture.

Q Okay. And what do you do now?

A I'm -- in 1999 I moved over to the United States with my American-born wife, and I have been farming in Britain as a farm manager and for absentee landlords, mainly with the farming company, the landed gentry and investment trust, that sort of thing.

Moving over here, was looking to continue to work in agriculture somewhere. It was just at the time that the Nutrient Management Act had been passed there and the Nutrient Management Act -- there was an obvious opportunity for someone -- for a need to be filled within the dairy community, both writing nutrient management plans, which the conservation districts were doing a lot of, but there was a -- there was a big burden of plans needed to be written, but also the follow-up work of helping dairies to comply with the nutrient management act.

So myself and four others joined together as a group called N3 Consulting and to provide primarily those services.

Q So just to backtrack a little bit and to be clear, how long did you do farm management and farm consulting in England?

A I had 12 years with a farm management company that I worked with and worked for. That included managing crop farms, the dairy farm, and also providing consulting services on several thousand acres.

Q And then how long have you been with N3 Consulting doing that type of work here?

A Since Valentine's Day on -- in 2000.

Q Okay. So can you -- let's start from the beginning.

Can you give the board an idea of dairy farm operations? What are the components of a dairy farm?

A The dairy farms, I think you've heard from previous testimony, range from one or two cows to several thousand cows.

They all have in common cows. The barns, the dairies, the milking parlors, the facilities now for collection of manure, for storage of manure, quite often the treatment as we were hearing with the separators, and then the equipment then to move that manure out into -- into the fields for fertilizing the fields.

And many of the dairies now are -- as they've been really economically been forced to grow, they have taken on multiple facilities as people have retired or sold out around them.

Many of the dairies now will have two, three, four farmsteads around the landscape of a county to try and house the animals that they have.

Q So the dairy farms -- the fields surrounding the dairy farms aren't contiguous? Is that what you're saying?

A They're generally not. My clients vary from half a dozen fields to three or four dozen fields.

And you'll have a patch of fields around each farmstead, but you'll also be renting fields from other -- other people in the county to provide the feed for your cows.

Q Okay. So who are your clients?

A The majority of my clients are dairymen. We do have contracts with -- occasionally have contract with conservation districts to write nutrient management plans, but most of our clients are dairymen and CAFOs.

Q And so most of them are CAFOs?

A Yes.

Q Okay. And do you have clients on both sides of the state?

A We do. The majority of our clients are actually north of

Seattle on the west side, but we do have clients down here all the way to Vancouver and also all the way over to north of Spokane.

Q And what sort of services are you providing to these clients?

A We started trying to fill that niche of the nutrient management planning, so we still do quite a lot of nutrient management planning.

We also then provide them with services that are required by the State to fulfill their requirements under the Dairy Nutrient Management Act, which would be the soil sampling, manure sampling, so we know what nutrients are in the manure and how it can be used as a fertilizer.

And we're also doing forage testing to show the impacts of what they're doing and any required needs from the crops that were not spotting very high.

Q So you mentioned nutrient management planning. Can you explain what that is?

A Under RCW 90.64, the Dairy Nutrient Management Act, every dairy is required to have a nutrient management plan. And they're quite specific that those are supposed to be signed off by the -- supposed to be approved by the local conservation district.

And the conservation district has to -- one of the things they have to check is that they're written to NRCS

standards.

And those plans are focused really on the manure and how the manure -- how much manure has been produced. One of the key factors of a Dairy Nutrient Management Act is that spreadsheets that books about balance and the number of cows, the size of the cows, the production of the cows, because that -- higher producing cows are generally fed a higher protein ration and will have a thicker, richer manure, and balancing that with the crop acreage on the farm and how those nutrients are going to come in balance with the crop land that's available.

Q So you also talked about samples that you do. Can you explain what kind of samples you do and why you do them?

A The majority of the sampling we do is -- is soil sampling where we're focused on the full soil nitrate test because that's required under the Dairy Nutrient Management Act.

And it's a good measure of how the -- how the field -- how each particular field has performed in terms of its nutrient balance for the year.

We're also taking an awful lot of manure samples throughout the year to basically show what the, in a lot of cases, is a very dilute nutrient source and trying to get a value on that so we can ascertain application rates to make sure we're applying agronomically.

Q Any other samples that you take?

A We're taking forage samples to show what the nutrient needs are of the crops too.
Q Is you take soil samples, you take manure samples, and you take forage samples mostly?
A Yes.
Q Do you also recommend what crops your clients grow?
A We do. Part of the nutrient management planning is to look at the whole farm and a balance of cropping.

And the -- regardless of rotation through fields, we'll give a -- give a solid nutrient balance. And one of the things that's required, in order to have a farm plan approved, is that there are enough crop acres of the right sorts of crops that they'll use the nutrients in the manure.

Q Can you explain the relationship between the plant -- the dairy nutrient management plan and a field budget?
A So the nutrient management plan is a big picture. It's a -- a one-time production that will stand until there are significant changes on the facility.

The nutrient budget is a year-by-year look at how is that field going to be fed for the year? What are the crops in that field? What are the crop nutrient requirements?

And the yield expectations of that -- the quality expectations of that crop and how are those expectations

going to be met, whether it be commercial fertilizer or manure, or from the soil itself, mineralization.

Q So a field budget takes into account the crop that's being grown and what nutrients that crop requires for what time period?

A That's for the entire season. That nutrient budget, yeah.

Q So for -- is that a year? A season?

A Cropping year, yeah.

Q Cropping year. So for each field, each field has a budget for the cropping year to account for all the nutrients that's needed for the crops that you plan to grow?

A Correct.

Q And is that something you do for your clients? You come up with these field budgets?

A We do. It's -- we've got a continuum of clients in terms of their understanding and requirements for our services. So there are many dairymen we work with, and we were talking about sophistication earlier.

Many of them have been to college themselves and have learned all this themselves. A lot of them are doing their own budgeting, but we do produce budgets for them.

Q So for the clients that hire you to produce a field

budgets or -- did you need a glass?

So for those clients that you work for that are asking you to do the nutrient budget, the field budget, and the management plan, and some of the soil sampling, what is their aim in hiring you? What are they hoping to achieve?

A Well, the aim of all crop farming is to produce the best quality and best production of -- that you can with CAFOs.

That's primarily so you can produce a good ration for your cows, that you can feed them well. So our aim is to get the best quality and production that we can from each field.

Q What type of crops do your clients typically grow?

A On the west side, each dairy is different, but the majority sitting with a balance of somewhere along the lines of 50 percent grass and 50 percent corn. The caveat is, there's a lot of land swapping hands during a season or from year to year, so there may be potatoes on those fields or other seed crops or berries.

On the east side, it's a similar sort of 50/50 mix, but the grass is generally replaced with alfalfa. It's far better suited to the east side of the state.

Then the other addition over the last 20 years has been more and more people growing cover crops over the

winter, either as triticale on the west side, or an annual rye grass is quite often planted on the corn crops on the west side that actually starts growing this time -- it's seeded this time of year, and basically the corn crop, it's already growing in the fall when the crop is harvested.

Q You said triticale on the west side. Did you mean the east side?

A Sorry. Meant the east side, although there is some triticale. As Dr. Harrison said, it's a pretty hardy crop. And we've been finding that in places where they have to go in after corn. It's one of the best alternatives. It's a cross between wheat and rye, and it seems to handle traffic and the winters better than either of those. So it's a good feed.

Q So in order to develop a field budget, which would also involve determining what crop to grow, what would you need to know to be successful in developing a field budget?

A You need to know the field really. You need to know the soil type. You need to know the crop, the variety, how it's performed, if it's a perennial crop, how it's been performing in the years up until that point.

So you need some pretty in-depth information about that field in order to -- for the budget to be relevant.

What's a good production number for a gravelly sandy field at one end of the farm is a completely different field than a nice loamy silt on the other end of the farm. So there's a lot of difference in field to field.

Q So is my assumption correct, that you can't do this from your office?

A No. You can't do this from the office.

Q So you spend a lot of time on dairy farms?

A Yes.

Q And you know those site-specific characteristics then to come up with your field budgets?

A That's my job.

MS. NICHOLSON: I'd like to move to admit I-3.

JUDGE FRANCKS: I-3 is admitted.

(Exhibit No. I-3 admitted.)

Q (By Ms. Nicholson) Can you -- everyone has a slightly different definition of this term, so I'm going to ask you yours.

Can you tell me, what is the agronomic application of nutrients?

A The agronomic application of nutrients is applying the right rate of nutrients to the crop at the right time, and if you, in terms of the society of agronomy, they'd also say the right place, the right time, the right

source.

Q I think there's another. It's the four R's of agronomy?

A Yes. Yes.

Q And how do you know that the application of nutrients is a -- is agronomic? Excuse me.

A It's -- a lot of it is based on the timing of the crop, the growth stage of the crop. With corn, you tend to feed it a lot early because, when you get it this time of year, you get this very rapid extension of a crop, and it needs a lot of food right then in order to get its yield.

So you tend to feed it early. Also, once it gets -- once it tassels, once you get into August, it's no longer taking up much nitrogen at all.

But grass crops, the aim with the grass or alfalfa crop is, you don't let it mature. You keep feeding it through the year.

As you mow it, as you harvest it, you're preventing it from seeding and maturing, so it's always in that vegetative state and so you keep feeding throughout the year.

So your timing is based very much on what type of crop you're growing.

Q How does the agronomic application of nutrients relate to dairy operations as a whole?

A It's integral really. It's a big old cycle. The

nutrients that are in the crops are being fed to the cows, and a lot of that is coming back out in the manure, and it's that primary fertilizer source for the crops.

Q Can I ask you to look at Exhibit I-4. No. That's wrong. Yeah. It is right. I-4.

And is that your expert report you submitted in this matter?

A It is.

Q And now I'm going to have you look at something else. I want you to look at the permit language on R-2. It's Page 17. That's going to be in one of the other binders with the green labels.

A R-2.

Q Mm-hm. And while you're looking for that, are you familiar the CAFO permits?

A I am.

Q Okay. And what I'd like you to do is look on Page 17. That should be the same page in the PDF, and I'm looking for permit language S4.I.1.

A Got it.

Q Did you include an opinion about this permit language in your expert report?

A I did.

Q And what was that opinion?

A I -- spring soil sampling on the west side of the state

is time-consuming, and it's an unnecessary expense. It's -- it provides us with numbers that we know are low. We've seen it for years. It was low in a similar climate back in Britain when I was farming over there.

If you don't feed your crop in the spring, you don't get much of a crop. It's -- consistently low.

Q Okay. You mentioned in Western Washington. Is there a difference in Western Washington/Eastern Washington and why would that be?

A In Western Washington we get three, four, five feet of rain over the winter, and it has its impacts. And --

Q Can I have you look at Exhibit I-37, please. And can you tell me what I-37 is.

Oh, I'm sorry. You're not there yet.

A This is the NRCS Washington State irrigation guide.

Q And did you include a subset of this report in your expert report?

A Yes, I did.

Q And was that around Page 8?

A Yes.

Q I believe you included one in particular; Mount Vernon, I believe?

A That's right, yes.

Q Okay. And what is this telling you? Is this -- what do you rely on for this data?

A Well, we use it primarily for irrigation scheduling, which, you know, despite the high rainfall in Western Washington, we still do have irrigation requirements in the summer.

But it was here really to just show the level of rainfall we do have.

Q On the west side of the state?

A On the west side, yep.

Q Can we turn back to Exhibit I-4, which is your expert report, on Page 3.

A Got it.

Q And can you tell me what that is?

A That's a table of the soil samples that we took in the spring of 2017 for a variety of clients in Northwest Washington: Snohomish, Skagit, and Whatcom Counties.

Q And you said these are soil samples that you took in the spring from your clients.

And where were they taken from? Three counties?

A Skagit, Whatcom, and Snohomish.

Q All western --

A All western.

Q And when were they taken? You said the spring. Can you give me a --

A We started in March, with the aim of getting the -- all the soil samples done that we needed, but last spring

being, you know, what it was, it -- we were -- spring soil sampling is a pain because you can't go on the fields when they're soaking wet to get a decent sample or all you'd end up with is a bag of mud.

So you have to time it for every field as the crop dries out, and you want to time the soil sample before you put manure on, or commercial fertilizer, for that matter.

And so you're jumping about from farm to farm to grab what samples you can on any given day. So while we started in March, it was -- it was beginning of June by the time the last of the samples were taken.

Q Can you go through the columns and explain what the columns are in your spring soil sample?

A Okay. If you go back one page to Page 2, the column headings are there. Starts with "Farm and Field Identifiers" and then the date that the sample arrived at the laboratory.

Then we've got columns for nitrate and ammonium in the soil, and then the following column is basically just a summation of those two, the total available nitrogen in the soil.

The next column is where I had it, the full soil test -- full soil nitrate test from the previous year and then obviously the county that the crop was -- the field

was in and the crop that was in the field at the time and then a few samples on some of those that match.

Q On the first page, I see one of the note says, "Not CAFO."

What does that mean?

A Some of the fields -- some of my clients aren't CAFOs. So that was a field that was run by a farmer who is not a CAFO crop farmer.

Q But you still take soil samples in the spring if they ask you to?

A If they ask me to. With the way that the fields seem to change hands, particularly in counties like Skagit County where there's a lot of -- there's a lot of field swapping going on, where Farmer 1 owns the land but doesn't want to farm it, rents it out to Farmer 2.

Quite often Farmer 3 gets involved for a year to rent it because it doesn't fit in with his rotation, so it -- there's -- a lot of that goes on.

And so we do take some field soil samples in the spring that basically it's a field that's new to a farmer, and he wants to know what levels of nutrients there are in it.

Q Looking at the very first entry, it's Farm 7, Field LB --

A Yes.

Q -- it looks like the fall -- and this is in milligram per

kilogram.

Is that different from parts per million?

A No. It's just a --

Q It looks like a fall sample was at 43?

A Yes.

Q And a spring sample was very low, like average was 3.8?

A Yes.

Q Does that mean that the 43 parts per million leached down through the soil?

A Not necessarily. The crop was a cover crop. It would -- it was likely a rye grass cover crop, which can take up to 70, 80 pounds of nitrogen in the fall.

And so, yeah, the crop can take up a significant part of that.

Q And that's accounted for in your nutrient budget; isn't that correct?

A Yes.

Q And that's per field it's accounted for?

A Yes.

Q Okay. So can we look at Exhibit I-48, please. And can you tell us what this is?

A This is just a graphical summary of that table of information.

Q And please explain the X and Y axis.

A So baseline what I did was block up those nitrate levels

into blocks of about four pounds, four parts per million.

So the first -- the first column is the first from 3 to 8 parts per million, and then the next, from 9 to 13 parts per million.

And then the left-hand axis, the Y axis, are the number of fields that are within that band of nitrogen level.

Q And what does that graph show you?

A Basically the vast majority of those samples came in below 20 milligrams per kilogram or parts per million.

Q And I see that there are some outliers here. Can you explain these outliers?

A A lot of those outliers or a lot of those fields we weren't able to get onto. Most of those outliers are fields we weren't able to get onto until that May, June sample timing when they dried out.

And it's -- we heard about mineralization occurring in the soil, and it's like sand going through an hourglass during the year.

What we're seeing is, as we get later in the year, more of the sand is flowed through the hourglass. More of the mineralization has occurred, so we're seeing more in the nitrogen available in the soil.

Q Do your field budgets account for this mineralization?

A Our field budgets account for the entirety of that

mineralization, all of the sand in the hourglass, if you like, for the entire season, yes.

Q So if this graph is showing us that the vast majority of fields are less than 20 parts per million, nitrogen in a spring soil, is that useful to you in any way?

A Not really. Because all it's telling us is how much of that sand is passed through the hourglass, how much of that mineralization has occurred.

If we use that as a standalone figure, then we have to reduce the mineralization figure that we put in the budget. Otherwise, we're double accounting.

So the implications of a soil sample in the spring are minimal.

Q So wait. Let me make sure I understand this.

So you already account for the mineralization that's occurring, and that this residual that's in the soil, that's already accounted for in the yearly budget per field; is that correct?

A Yes.

Q Okay. So does it serve any useful purpose in Western Washington to know that that spring soil sample is less than 20 parts per million?

A I don't believe it does, no.

Q And how much does a soil sample cost to take in a spring soil?

A Fifty to eighty dollars.
Q Per sample?
A Per sample.
Q And that's what you charge your clients?
A Yes.
Q Is this data set typical of what you have seen for the past 18 years?
A It is, yes.
Q And is this typical of what you saw back in England as well?
A Yes.
Q So this would be typical of any rainy type of client -- or climate?
A Yes.
Q Is there anything else that supports your position that these spring soil samples don't contain useful information?
A There are academic articles out there that reference it.
Q Can I have you look at Exhibit I-38, please. Can you tell me what I-38 is?
A This is an article written by Bittman and Kowalenko from the research center up at Agassiz at British Columbia.
Q And is this a resource upon which you rely, a British resource?
A The Agassiz Research Center is one of the primary forage

grass research centers in -- on the west -- west coast. And its climate is very similar to Whatcom and Skagit Counties, so, yes, we use their data.

Q And where in this paper does it support your opinion? I think you want to look at Page 6 of 7.

A The second from last paragraph on the right-hand column, starting with spring. "Spring soil nitrate testing did not show promise for predicting N responsiveness of the sites.

"The inorganic nitrogen in the spring that was measured was likely released by early season soil mineralization of soil organic N since autumn nitrate will be leached beyond the root zone during the winter."

Q And just to ask a follow-up question there, if the soil nitrate is leached beyond the root zone, does that mean it goes to groundwater?

A Not necessarily. But, you know, I'm not a hydrogeologist, but not necessarily.

Q Okay.

JUDGE FRANCKS: Ms. Nicholson, I'm going to point out that it's a little after noon, so when you have a good breaking point, we'll take a lunch break.

MS. NICHOLSON: Okay. Just a few more minutes.

JUDGE FRANCKS: Okay.

Q (By Ms. Nicholson) And is there any other -- actually, I'm just going have you look at I-39.

And what is this paper?

A This is another piece from Canada from the Farm West website, which is run by the Agassiz Research Station.

Q And, again, this is a resource upon which you rely?

A Yes.

Q And where does this support your opinion?

A Somewhere in that second paragraph. In the middle of there, it's paragraph starting -- sorry -- sentence starting, "In locations where carrier of a nitrate is leached below the root zone over winter, a pre-plant test has limited value for determining fertilizer applications -- fertilizer requirements."

Q And, again, if it leaches below the root zone, does that mean it's going to groundwater?

A Not necessarily, no.

Q Okay. But the fact that it's not there doesn't help you plan for agronomic application; is that correct?

A Correct.

Q Can we talk a little bit about your expert report. I noticed that that has an updated expert report of David Haggith.

Can you tell me why you updated your report?

A Following my deposition, I -- there was a request that I

supply more information.
Q And so which -- in response to a request by a Puget Soundkeeper counsel, what did you update on this report? Was it in your soil sample data?
A It was -- there were some samples, eight samples, that weren't included in the original data set. Plus, there was extra information about the location of the -- of the fields that were sampled.
Q So can you tell me which columns maybe that you added? And you can go back to Exhibit I-4 on the second page of your report, if that will help you.
A I think I added the county, the crop, the notes, and I may have even added the date. I'm not sure.
Q And that date is when the lab processed the soil sample?
A Yes.
Q So you gave them more information and ensured that every single spring sample you took in the spring of 2017 was included in this table; is that correct?
A I did, yes.
Q And did the data set change?
A The data set changed by eight samples.
Q And did the data set change of adding eight samples? Did it change your results or your opinion?
A No. No. In fact, it was a process to go through because it clarified in my mind what was helping there with

eight.

Q So the eight samples that you added, did that make it more supportive of your conclusion?

A It did.

Q Okay. So can you summarize your opinion about spring soil samples in Western Washington for us.

A I don't feel that they're worth the hassle and the expense because I don't see them having a significant impact on the nutrient budget for the crop for the year.

Q So if I stated it has no value and is an unnecessary cost to producers, would you agree with that?

A I would, yes.

MS. NICHOLSON: Okay. I would like to move to admit I-34, I-38, and I-4.

MS. MATSUMOTO: Your Honor, we object to the extent this data set includes samples that weren't collected from CAFOs. We've raised this argument previously.

Additionally, I know there's not a fall sample from any of the data points that are listed here, and so it's difficult to really rely on any opinions that are drawn from incomplete data.

MS. NICHOLSON: Your Honor, the fall sample is just included as another data point, if he had it. This is about spring soil samples, so the fall data

is just extra information.

And the fact that it's not a CAFO is immaterial here. You're still doing a spring sample on a farm field.

So whether that field belongs to a CAFO or it doesn't belong to a CAFO, that is really immaterial. The data shows that the sample results in such a low part per million that it has little value.

MS. MATSUMOTO: But we're here about the CAFO permit, and without knowing, as Mr. Haggith had said, the field specific cropping history, the manure management history of a field, whether or not it's a CAFO provides little to no relevant information.

MS. NICHOLSON: And at their request, we added every single spring test that he took, which included some that were not CAFO.

MS. MATSUMOTO: And I would add that should have been added in the initial report because it was directly responsive to discovery requests that were issued well in advance.

MS. NICHOLSON: So they're arguing that we included the data that they asked us to include?

JUDGE FRANCKS: I'm going to allow it. Obviously you'll have cross-examination where you can delve into this, so --

MS. NICHOLSON: We are at a good stopping point.

JUDGE FRANCKS: Okay. But let me just admit the things you just asked for. I-4, and what else?

MS. NICHOLSON: I-38 and I-39.

JUDGE FRANCKS: I-4, I-38, and I-39.

MS. NICHOLSON: And two more. And I-37 and I-48.

JUDGE FRANCKS: Okay. I-37, I-38.

MS. NICHOLSON: 48.

JUDGE FRANCKS: 39 and then I-48.

MS. NICHOLSON: Right.

JUDGE FRANCKS: Those all admitted.

(Exhibit Nos. I-4, I-37, I-38, I-39, I-48 admitted.)

JUDGE FRANCKS: Let us go to lunch. We'll come back at 1:15.

We are off the record.

(Recess from 12:14 p.m. to 1:15 p.m.)

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

Ms. Nicholson, proceed.

MS. NICHOLSON: Thank you.

DIRECT EXAMINATION (Continuing)

BY MS. NICHOLSON:

Q Turning to the permit language -- can you make that a little bit bigger? And this is an R-2, S4.I.1. That's Page 17 on PDF.

Do you have that?

A Yes.

Q Is there any other requirement in this permit language that is a significant issue for your producers?

A It's this referral to T-sum 200.

Q And what is T-sum 200 again?

A T-sum is a summation of day degrees from the beginning of the year, starting January 1. T-sum 200 is when that summation reaches 200, which in Whatcom County generally falls somewhere in the -- in the first half of February. Can occur as early as the end of January.

Q And why is that a problem?

A It's not a problem in such that it -- it's grounded in good science. It was put together back in the '80s is when I first heard about it.

Fertilizer companies in Europe who were looking at what was the best timing, what was the most beneficial timing to start applying nitrogen to growing crops, particularly -- well, specifically grass crops, and cereal grains in the spring.

And it's definitely borne out in terms of if you're

looking for best yield of wheat, then you need to be putting on fertilizer of T-sum 200. Applies just as well to grass.

The problem is, all it takes into account is temperature. And it was focused very specifically on commercial fertilizer, which doesn't have -- you know, which is a very dense nutrient source.

You can fit on a handcart at Home Depot the amount of nitrogen you could fit in a lagoon or a tank this size of manure. So it's a very dense nutrient source.

When you're talking about manure, you've got a lot of potential for runoff. You've got a lot of potential for other issues that surround manure, and I just think we need to be looking at more than just temperature.

Q So did you recommend a different alternative in your expert report?

A I looked at the application resource -- application risk management program that's been developed in Whatcom by the conservation district there under EPA ground.

Q And why is it superior to T-sum?

A It looks at a much wider set of characteristics. It looks at -- initially it looks at weather forecasting. It then also drills beyond that.

Once you've got a weather forecast that looks good, you have to look at the soils that you have in your field

and the various risk factors that you have in your field, such as proximity to groundwater, proximity to surface water.

You also need to assess your crop to make sure that it's of a dense enough stand that it needs and can utilize that manure.

So it looks at a variety of far bigger variety of factors.

Q That sounds like it's very site-specific factors. Is that --

A Yes. You can't really do -- you can't really fill ARM and fill out the reports or the spreadsheets that are required for it without putting your boots on and getting out in the field and digging holes.

Q And where is ARM in use currently?

A It started off in Whatcom County and has basically spread out. It includes all the farm plans that are written now in Whatcom, Skagit, Snohomish. Also King County has adopted it and the dairy -- the dairy inspection program with Washington State Department of Agriculture.

They're recommending that, particularly in the shoulder seasons, in the spring and the fall, that people use that as their method of ascertaining which fields and when is an appropriate time to apply.

Q So your clients in Whatcom and Skagit and Snohomish and

King County, they are using ARM currently?
A Yes.
Q And how is it working for them?
A It's working very well. It's borne out with the water quality numbers that we're seeing. We're just -- we're seeing people applying at less risky times.
Q And what evidence do you have of ARM working within Whatcom County?
A The County is routinely sampling water in a process that really looking at the shellfish beds but looking at also the surface water within the county, all the main tributaries to the Nooksack River. And the Nooksack River itself are sampled every month.
Q Can I have you look at Exhibit I-46 because I believe that's what you're speaking to.

And can you tell me what this is and where you obtained it?
A So this is a report from the Whatcom County Public Works that was presented to a joint shellfish protection area meeting, looking at -- two different graphs.

The top graph is the time period 2012 to 2014. The lower graph is '15 to '18. Each bar represents a different sampling location within the county, and the bars represent an average of that total data set.

So that 30-something samples that they took within

that time period is averaged, and the little black dots are just the final 12 months of that time period.

So -- and then the line across the middle is that 100 fecal coliform where surface water -- where the surface water standard sits in terms of that's the number we're trying to meet.

Q So just to interrupt you just briefly, on the top graph in the 2012 to 2014 time period, in the last year, the mean was actually higher than in the --

A Yes.

Q -- the previous years?

A So the point of presenting this here and the point also of presenting it to the joint shellfish meeting was to say that, look, back in 2012 to 2014, our numbers generally were higher, but they were also rising, and there was some concern of what was happening out there in the county.

Now, this latest data set from 2015-2018, the little black dot is within the bars of the line -- the bar, and showing that the latest 12 months are actually better than the average of the 36 months.

And those -- the 36th month lines are also lower and so basically it's just showing that water quality is getting better.

Q And do you attribute that to the use of ARM?

A I think there are a lot of factors in play. But I think, when you look at the CAFOs in the county, that's the biggest difference between those two, is the widespread use of the ARM program in the county.
Q And has ARM been published in any peer-reviewed paper?
A It is in the -- there's an article about it in the Journal of Environmental Quality that compares and considers it and several other similar programs throughout the nation in different states and looking at how they -- what different factors they take into effect and into account, and then just looking at the sciences that's moving forward, and really just a report on what's happening in other states.
Q And do you agree with Dr. Harrison, that the Journal of Environmental Quality is a reliable and reputable source of new and groundbreaking research?
A That's certainly the reputation it has, yes.
Q So when was it published?
A I believe in 2017, second half of 2017. I'm not sure.
Q Okay. Is ARM more protective of ground and surface water?
A I believe it is, yes.
Q And why do you believe that?
A Because of numbers like this and seeing my clients and other farmers around using it effectively as a tool to

protect groundwater, surface water particularly, but also groundwater too.

Q So is it your opinion that the permit should use ARM instead of T-sum in Western Washington under the permit S4.J?

A I think, if the aim is to protect water quality, then yes.

Q And does it give you any hesitation to use ARM because it hasn't been considered final by Whatcom County?

A No. Just because of the results of it. I certainly recommend my clients to use it because it gives them that extra level of clarification of the situation in a particular field on a particular day.

And it's a document that they can fill in before they apply, print out, and they can show that they took into account the considerations of depth to soil water and closest to surface water, the slope, all the different considerations in the field that would be logical to take into account a -- they can actually catalog them as they proceed.

Q So is it correct to say that the T-sum 200 takes into account one piece of information, which is temperature?

A Correct.

Q While ARM takes into account site-specific information?

A Yes.

Q Okay. Should the permit use ARM instead of T-sum 200 in Eastern Washington?
A It hasn't been -- it wasn't designed for Eastern Washington, and I don't -- I'm not aware of any work they've done in Eastern Washington using ARM, so I wouldn't -- I wouldn't propose that.
Q So ARM was designed basically for British Columbia, Western Washington?
A Yes.
Q England?
A It would be a good tool to use in England too, I think, yes, in terms of spring weather.
Q So can we turn to R-2 under Section S4.J, and I'm looking under the "Restrictions" under Subsection 3. I believe that's on Page 21 in the PDF -- 20.

So in Eastern Washington, what would you recommend for spring application?
A I -- I think, within the permit conditions themselves, they are pretty clear about not applying in conditions where manure is going to move, so I don't know that the ARM program would fit Eastern Washington, but the permit conditions would still apply.
Q Yes. And would those permit conditions be protective of groundwater?
A I believe they would.

Q And what are those conditions, if you would list them for me? What -- when can you not apply under this permit?
A Can't apply to fields that have got a frozen crust or if the soil is below zero degrees Celsius; to fields that are snow covered or to fields with saturated soil, or if the water table is within 12 inches or less of the surface; and then also if precipitation is forecast within the next 24 hours; and then to fields that are bare unless the permittee is preparing the field for the next year's crop.
Q And the reason why that's protective is because of climate?
A It's -- yes. Because climate is just -- you're not expecting the kind of rain events that we get in Western Washington with great regularity in the spring.
Q So it's your opinion to use ARM on the western side of the state to make that determination; is that correct?
A Yes.
Q And on the eastern side of the state, you think you can rely on the permit terms as they stand without using the artificial date of T-sum 200; is that correct?
A I do, yes.

MS. NICHOLSON: I'd like to move to admit I-46.

JUDGE FRANCKS: 46 is admitted.

(Exhibit No. I-46 admitted.)

Q (By Ms. Nicholson) Can you turn back to Page 17, and I want you to look particularly at the fall soil sample requirement in the permit.

A Page 18?

Q Might be 18. Sorry.

A Okay.

Q So is the fall soil sample requirement attainable for all of your clients?

A Well, here the hiccup is this October the 1st, comma, after harvest of annual crops. Well, that isn't after harvest of annual crops in the majority of cases.

Corn is only just adapted to our climate on the west side of the Cascades, so you don't want to get a mature crop. You try and leave it as long as you can in the field, which often leads to harvest happening in the -- well into October.

Q So earlier we heard that farmers cannot take a sample prior to harvest because it causes crop damage and waste.

Do you agree with that?

A Yes. You've got to take -- in order to take a decent soil sample, you've got to cover the majority of the field in a randomized pattern, and you just can't do that in a 16-foot crop of corn.

Q Would you obtain valid data of a fall soil sample test

while the crop was still growing?

A Well, that's the other side of things, is that if your crop is growing, it still has the potential to be taking up nutrients.

Better process would be to take it after harvest, but the stipulation then is, if it's after October the 1st, we have to go down to the second foot.

And sampling at that second foot in early October when the soil is not yet moist all the way down, you -- it's really difficult to get down there for a second foot.

We've had to -- a 300-pound guy on the end of a soil probe, beating the dickens out of it and breaking all sorts of equipment just to get down to that second foot.

Q So what you're saying here -- I'm just going to interrupt you briefly -- if your producers are still harvesting after October 1st, under the permit terms, they are then required to take a second foot regardless of whether the heavy rains have come for the fall; is that correct?

A Correct.

Q Okay. And the problem with that is that the second foot is difficult -- a second-foot test is very difficult to obtain when it's dry?

A Yes.

MS. MATSUMOTO: Objection. Leading.

JUDGE FRANCKS: I'm going to allow it.

A The second-foot sample -- the top foot of soil is what's generally tilled. So it's nice and loose, and it's very easy to take a sample of the top foot.

Once you get below that top foot, you're into much tougher, tighter soil. And with the addition of moisture, it's easy to take a sample. While it's dry and hard, it's a more difficult job.

Q (By Ms. Nicholson) And have you taken second-foot soil samples?

A We have when the dairy nutrient back was first put in place. The NRCS 590 standard was to sample to two feet.

And in that time period, between Dairy Nutrient Management Act coming into place and the production of the Sullivan/Cogger document about the four soil sampling, there were a lot of second-foot samples taken.

And part of the reason for this -- the Cogger/Sullivan report was to look at, when was a good time to be going down to that second foot because they didn't want a bunch of irrelevant work being done out in the field.

Q How much extra time did it take to take those second-foot --

A When the ground is dry, it -- three or four times the length of time it would take to normally sample a field.

Q So let's just take Whatcom County as an example. When do the heavy rains normally come in Whatcom County?
A We usually see them -- when we're talking about heavy rains, we're looking at four to five inches of rain. That's about what it takes to saturate the top foot of soil.

And that's what it takes for us to start seeing a full-foot soil probe having moisture all the way to the base of it, and that -- it's -- usually we're into the second half of October usually when that happens.

Last year it was in the -- around about 23rd to the 26th of October, we got several days of pretty intense rain, and that got the soils wetted up.
Q Are dairy producers inclined to harvest after heavy rains begin?
A No. And people like to push out the envelope and get the crop as mature as they possibly can, but the last thing you want to do is have your field in standing -- standing in rain because partly pushes up the moisture content of your crop, but it also makes harvest messy and more complicated.

So people tend to watch -- be watching the weather forecast very closely in October to make sure their crops come off before they get very heavy rain.
Q So can you obtain a valid and useful fall soil nitrate

test of October 1st but before the heavy rains?
A Yes.
Q What would happen if a farmer or producer misjudged and they harvested and took their sample after the heavy rains began? What do you think should happen?
A Then they should be going down to the full two feet. They should be.
Q And why is that?
A Because there is the potential to move nitrogen down with that rainwater.
Q And in that case, the water has penetrated the soil level. Is it easier to get the soil sample at that point?
A Oh, yeah. It's much easier.
Q And does second foot actually contains valuable data?
A Yes.
Q So is it your opinion that the October 1st date is unattainable?
A I -- it's unattainable, yes. I mean, that -- yes.
Q Have a pretty easy solution to that permit language?
A I think, you know, the Sullivan/Cogger information is basically showing that we should be sampling after that significant rain in the fall.
Q Right before that significant --
A Right. Right before that significant rain, even if

it's -- even if that pushes us into October sampling at a foot, and then once we've had that significant rain, then going down to two feet.

Q And we've been talking about the fall soil nitrate test that's also called the FSNT; is that correct?

A Yes.

Q And can you give us a little idea of what you're using the fall soil nitrate test for.

A Some people call it the report card test because it's -- you're basically looking at the level of nitrogen that's in your -- in your field remaining at the end of the year after the crops come off.

Q If you could look over your shoulder to Table 3, which has categories of fall soil nitrate tests, does the high FSNT necessarily cause you concern?

A Like all soil samples, it's something that has to be taken while considering the crop and the field that was -- that was grown there and any crop that may be continuing to grow there and also look at the timing.

The fall soil sample could happen anytime from the beginning of September to the end of October. Having -- that's a big chunk of the growing season, and crops needs to grow.

So just because it's in the high level, you've got an actively growing crop, they could be using those

nutrients.

Q Does a very high FSNT necessarily cause concern? And under "Very High," look at that box. It's 45 parts per million.

A So, again, the same sort of thing applies. The -- obviously, once you get up to that 45 parts per million, you start to get more concerned.

So, yes, I mean, it's certainly more concern than the -- just that 30 to 45 parts per million, but you still -- if you've got an actively growing crop, a good percentage of that nitrogen is going to be used.

Q And do very many of your clients ever see a 45 parts per million, a very high fall soil nitrate?

A We see some every year. There are conditions out in fields that you can't control the climate, and so --

Q What are those conditions? Maybe you could explain that.

A Okay. One of the -- there are several. One of the classics is, you plow down a stand of grass, and it takes -- you know, you had your grass in the field for five or six years.

It's got five or six years of growth under the ground there with the roots and the crown of the crop. When you plow that down, you get a big release of nitrogen from that.

You can't control that, and that tends to result in

that first year of let's say another annual crop, going back to grass, that year you do see a pulse above 45 parts per million quite regularly.

Q So --

A And another cause, sometimes in -- we've had a very dry August and a dry September and we get a high rainfall event in September.

While the soils are really warm, we will see a -- it's almost as if there's a capture of mineralization at that point. You can quite often, for a few days after that high rainfall, see, again, a high nitrate level then.

Then there'd also be -- if you had a fiasco in the field for some reason, that you had some sort of either crop failure or a -- something impacting the crop to the point where there's disease or pests or to the point where the crop really hadn't performed over the year, and you can see high nitrates then.

Q So is that a one-time sort of spike that you see or is this a sustained issue that you see?

A Those tend to be one-time spikes. The next year you're back down, and you've seen the levels that you 'd hoped to see.

Q So are the recommended actions then for the very high FSNT, is that a reasonable recommended action

necessarily?

A I think they're all reasonable other than the requirement to submit the nutrient budget for that field to the Department of Ecology the next year before you can start applying.

And my concern with that one is literally just, you know, not to be rude, but the time that it takes for the bureaucratic wheels to move, the farmer can't produce the budget under this current permit until the spring soil sample is taken.

And so that's -- that's the time constraint in its own -- on its own.

And then the budget has to be produced and delivered to Department of Ecology, and I can't see how Department of Ecology could make any sort of decision on that without actually going out and seeing the field and talking to the farmer about it, at which point we've got a lot of constraints in the way to getting the crop moving and in and productive for the next year to have the right sort of impact on -- on full soil nitrates without having a very negative impact on cropping.

Q So if one of your clients had a field in the very high category for three years, what would that tell you?

A That he wasn't listening to the advice he was paying for, that the aim is to be below that, that that's not --

Q That would be a highly unusual event?
A It would be unusual. It's not what we see. There would be something going wrong there. It would be -- we would need to address.
Q So the recommended required actions based upon trends for the very high category, would you say that those are appropriate? That's the very bottom right box.
A I think that's appropriate.
Q Under Table 3, when you're helping your producers figure out what they're doing with their fall sample soil nitrate, does this table, in your opinion, include the necessary information for you or your producers to understand if they could apply for a -- or how does this -- let me start over. Start that question completely over.

How does this table reflect your field budgets for a double crop or a perennial crop?

A So this table standalone, the double crop would be an addition to that, but it -- the field would still have to comply with this, from my understanding.

So it's not -- the double crop isn't a get-out-of-jail-free card. It's an addition to this.

Q So regardless of what you're doing, what you're planting, or what cropping rotation you're using, you're still required under the required actions and the required

actions based upon trends based on a fall soil nitrate test sample in the fall, is that correct, per field?

A Yes.

Q Okay. Thank you.

I want to return to T-sum 200 briefly. Just to be clear, does T-sum 200 -- was it designed to work in Eastern Washington?

A No.

Q And does it work in Eastern Washington?

A Not that I've seen. The climate is just so different. I mean, talking about high desert versus a temperate coastal zone.

And also the crops like alfalfa that are just -- it was never designed for that sort of crop.

Q Okay. And once again, just to make sure we're clear, can your agronomic budget, your field budget, per field, can it account for spring nitrogen loads without a spring soil sample?

A Yes.

Q Okay. How do your clients fund big infrastructure projects?

A Usually by going to the bank or looking for what grant funding is available, or cashier money.

Q And what kind of cashier money is available?

MS. MATSUMOTO: Objection. This is

outside the scope of what's in Mr. Haggith's expert report.

MS. NICHOLSON: Again, Mr. Haggith -- he helps clients get this sort of funding, so I'm just exploring that so you can understand what it would take to get the funding.

JUDGE FRANCKS: I'm going to allow it. I think it goes to the issues in this case.

A Well, the big one or the -- there are two main sources through the Conservation Commission and through National Resource Conservation, which is the federal money, and there's some significant sums there.

For -- particularly for the federal money, though, you need to have a comprehensive nutrient management plan, which is a different document, again, to the Dairy Nutrient Management Act or the Manure Pollution Prevention Plan that's there under the permit.

Q (By Ms. Nicholson) So what's in a comprehensive management plan?

A So you have to look at -- you have to do a resource assessment of the entire farm and risk assessment, and it's looking at not just nutrient management but also looking at air quality and all sorts of other environmental issues.

And that -- it's part of a holistic system that you

basically are required to fulfill all the parts of the comprehensive nutrient management plan, and that includes the Tech Note 23 assessment or lagoons and a requirement to bring the lagoons up to standard.

Q And are we talking in particular with -- for NRCS equipped funds? Is that what you're referring to?

A Yes.

Q And do you help your producers apply for NRCS equipped funds?

A I do. That's part of the training I got along the way to produce the nutrient management plans, was through NRCS, and considered a technical service provider with NRCS for farm planning.

Q And these NRCS equipped funds, are they in any way limited?

A There's a lifetime cap of $450,000.

Q A lifetime cap. So for the lifetime of that producer --

A That producer, yeah.

Q -- 450 is the maximum they can get?

A Yes.

Q So if you are applying for NRCS equipped funds and you have already utilized some of that money, say, $250,000, to build a new lagoon, 200- to 400,000 for a new lagoon, is that, in your -- in your opinion, is that what that costs to put in a new lagoon?

MS. MATSUMOTO: Objection. Lack of foundation.

A The --

JUDGE FRANCKS: I think he can answer.

A The lagoons are, yes, in the hundreds of thousands to build. It really just depends on size, depends on location, what sort of material is used to line them. They can get very expensive. They have to be built aboveground completely.

Q (By Ms. Nicholson) Okay. So if you have spent a couple hundred thousand on a lagoon, a new one or rebuilt, and you have another big project outlay, all you have left is the balance from the NRCS equipped funds; is that correct?

A Correct. I'm working with a few clients at the moment who already have money, say, for separators or pipelines or lagoons, and then they're working on that reduced balance that they can apply for with NRCS.

Q And for those equipped funds, anything that is found in the comprehensive management plan that is not to standard has to be fixed with the funds granted too; is that correct?

A Yeah. You can fix them with whatever money you can get your hands on, but that tends to be the focus, that you have to bring things up to standard.

Q And how easy is it to get NRCS equipped funds?
A It's not that easy because you need the plan, and you need to wait in line really. I mean, there's no -- it's not unlimited funding out there, so there's only a certain amount every year that's available.
Q So you might not be able to get your full allotment of $450,000 per lifetime in a single year; is that correct?
A Correct.
Q Do you know if NRCS equipped funding would be available to retrofit a lagoon that currently meets NRCS requirements?

MS. MATSUMOTO: Objection. Mr. Haggith is not an expert in lagoons.

MS. NICHOLSON: He's not addressing lagoons. He's addressing the equipped funds and whether it's available.

MS. MATSUMOTO: In the context of lagoon retrofitting?

JUDGE FRANCKS: Well, I'm going to allow it.

A I don't think -- you know, as long as it met the NRCS standard, that's what the funding is there for. I don't believe that they fund above that, if there were other issues that were within -- under the NRCS comprehensive nutrient management plan that seemed to be of higher

importance.

Q (By Ms. Nicholson) If you're using an agronomic application with your field budget per field, do you anticipate any leaching to groundwater?

A The aim of an agronomic application is to apply what the crop needs, with the expectation that the crop is going to take that up.

You're applying it when the crop needs it at the level the crop needs. So your assumption is that that would lead to no leaching.

Q And, once again, when you are creating a field budget for your clients per field, you are accounting for all of the nutrients for that crop growth year, and does that not include cover crops and perennial crops?

A Yes.

Q And does that -- so you have planned out, and it includes mineralization. It includes what is residual in the spring, and it includes the crops that will be grown and their nutrient needs; is that correct?

A That's correct.

Q And so all of that is accounted for in your field budget?

A Yes.

Q And under Table 3, does that reflect what you're doing with your field budgets then, accounting for the perennial crops and the cover crops?

A Yes.
Q So under this -- it takes a fall soil sample test in the fall per field?
A Yes.
Q And requires recommended actions based on that test?
A Yes.
Q And does it take into account that you're planting a cover crop and that you have accounted for in your field budget already?
MS. MATSUMOTO: Objection. This has been asked and answered already.
JUDGE FRANCKS: I'm going to allow it because I'm not sure it has.
A The problem is, it's really -- at face value, the table is just saying this is high, this is medium, this is low, and it isn't taking into account the fact that there may be a crop growing there.
And it really doesn't -- there needs to be explanation of why there is a result in order to really understand what that number means in terms of whether there's a growing crop there, what time of the season, what time of that -- within that sampling period that a sample was taken.
Q (By Ms. Nicholson) And would taking into account all that information -- would that be more protective of

groundwater?
A Yes.
Q And why?
A Because I think, you know, a 40 or however many part per million soil sample taken in September underneath a growing crop is a very different kettle of fish than a soil sample taken at the end of October on bare soil.
Q And you were here all -- not last week, but the week before and listened to the testimony that was presented; is that correct?
A Yes.
Q And you spend a lot of time on dairy farms; is that correct?
A I do.
Q Mr. Erickson showed some pictures of lagoons with erosion from a pipe and some questionable line surfaces.
Do you recall those pictures?
A Yes.
Q And are those pictures typical of the lagoons you have observed in the state of Washington?
A No.
Q And why is that?
A Well, part of it is -- under the Dairy Nutrient Management Act, one of the things that's under there as a standard is an operation and maintenance plan in

everybody's -- well, for manure storage, for everybody who has manure storage, and that requires that lagoons are maintained in the state that they were designed and built.

Q So -- so repairs would be required, is what you're saying?

A Repairs are required under the Dairy Nutrient Management plan, repairs and maintenance, and they're inspected every 18 months or so by Department of Agriculture when they do their dairy inspections.

Q There has been some testimony on emergency applications of nutrients, and that's in the permit on S4.J.5.

And did you want to add a little clarification on emergency applications of nutrients for the board?

A I was just -- it came to my mind when it was being discussed earlier, that although the permit allows emergency land application and it cites things like to protect from lagoon failure, you know, obviously it's better to allow some application to some dry fields than to have a lagoon running over.

But the thing that wasn't really focused on is the fact that it was -- it doesn't excuse you from any of the other requirements of the permit. That's -- that application would still have to be accounted for in the nutrient budget for that field or those fields for the

season.

So while it allows this emergency application, it doesn't say, "Well, we allow it, and we forget about it. We allow it, but we include it."

You know, it has to then -- it's part of the nutrient application to that field.

Q And you testified a little bit earlier about how fields on dairy farms are not necessarily contiguous. They're all over the place and they have different types of soil.

Even in the western side of the state that tend to be wetter, can dairy producers find an appropriate field for an emergency application?

A Most the dairymen that I'm working with have got, you know -- even in the wettest places of Whatcom and Skagit Counties, they've got somewhere they can go, either by chance or by design, so that if they have a need to apply in the winter, they can find a field that's that little bit higher, that little bit drier, that will take the manure.

And under -- certainly under the more recent Dairy Nutrient Management Act plans that have been written or updated, those fields have been identified within the farm plan as being fields that are suitable for winter application.

MS. NICHOLSON: Okay. I think we're

done.

JUDGE FRANCKS: Okay. Ms. Barney?

CROSS-EXAMINATION

BY MS. BARNEY:

Q Good afternoon, Mr. Haggith.

A Good afternoon.

Q I'm going to ask you to turn to your expert report I-4. Don't put that one away because we'll be going back to the permit, so --

A Okay. Got it.

Q So starting on Page -- well, starting on Page 2, as Ms. Nicholson took you through, we do have spring soil sample data here. And I guess I just have a couple of questions.

Looking at Page 4 at the bottom, sort of four lines from the bottom in that column, do you see where -- let's see -- Farm No. 7 on the 8th of March has a nitrate of 14.9, ammonium of 6.9, for a total available of 21.8 nitrogen?

A Yes.

Q And then the line below that, different farm, it appears, but similar numbers in the 20s for the spring sampling?

A Yeah.

Q Then over to the top of Page 5, again, you know, where we have a total available, sort of bouncing -- top of Page 5

is a little different because the ammonium there seems to be the higher contributor to the total nitrogen there --

A Yes.

Q -- for 24.

And then at the very end of those columns, we have some numbers that appear to be getting much higher, and these are samples in June.

A Yes.

Q Now, I think I heard you describe that some of the farms, you couldn't actually get onto the fields until June --

A Yes.

Q -- at that point.

So are these numbers representative of those where you couldn't get there until later or had nutrients been applied to these?

A No. Nothing had been applied to those -- those ones in June. They've just been too wet to apply to, too wet to drive on.

Q Okay. Thank you.

Did you amend other parts of your expert report other than just adding the data?

A Adding the data, yeah, and clarifying, you know, the locations, that's -- those were the --

Q Right. That was the only change that you made?

A Yes.

Q You didn't change any of the other text?
A I don't believe -- oh, in terms of just clarifying my conclusions from the data, I think I made some changes to that.
Q Could I ask you to look at Page -- let's see. Sorry. Want to get to the right place here. Look at your Paragraph 6, which is on the bottom of Page 8.
Do you recall making a change here?
A I don't recall making a change there, but since it's based on the spring soil samples, I may well have done it.
MS. BARNEY: Because -- well, we can take a look at it. If I may, Your Honor, I've got some copies of the earlier version.
Can I distribute those?
Q (By Ms. Barney) So I'm looking, in particular there, in Paragraph 6 in the first sentence. I'll just read it out of the copy that I just handed to you.
"So more practical and reasonable approach would be to remove the expectation of spring soil sampling in high rainfall areas and base the nutrient budget on the knowledge that there will be a small but significant amount of available nitrogen present in the soil in the spring."
And yet in the version that you submitted in March,

you took out the word -- you took out "but significant."
A Okay.
Q And I'm just curious as to why you made that change.
A I'm not sure why I made that change.
Q So in thinking about the amount of nitrate that would be present in the spring, do you still believe it's possible that that amount can be significant?
A I think that that's the whole point of including all that mineralization for the entire season, is that it's happening through the year, and, regardless of the time of that soil sample, some of that mineralization will have shown.

I don't think we can discredit that. I think that's, you know -- I think we're seeing what's there.

It's -- it's an important -- that mineralization is an important source of nutrient for the crop that can account for the third of the nitrogen that the crop needs.

In terms of its implication for our nutrient budget for the full year, whether it's there or not in the spring, we know it's going to be there in some stage during the growing season for the crop.
Q And how are you testing your assumptions with regard to the rate of mineralization? Are you measuring mineralization?

A Mineralization is one of those things in soil science that people have been trying to grab ahold of for decades, and it's just so difficult to put a handle on it because of climate, because of changing soil types and different crop management practices, that it's very difficult to get a hard-and-fast and numeric equation that we can apply to it.

It really has to be done -- the only real way to do it is to look at what you typically see from season to season on that farm or on that type of field historically.

Q But wouldn't -- you can't measure total nitrate in the field, though, in the spring?

A You can in terms of the implication of total nitrate to what's actually going to be there and available for the crop to use for the entirety of the season.

When you're just taking a snapshot in time in the spring, that's where I find that it isn't significant. It is just a snapshot in time in something that's this moving continuum that's much bigger than what we see in the spring.

Q Would you be limited to just one time in the spring? Could you sample throughout?

A You could sample forever if you have the -- that's the thing is that we can -- we can do -- we can require all

of these soil samples throughout the year, and many people do take other samples in the spring.

The Pre-Sidedress Nitrate Test was mentioned as being one that we -- that there's some real value to sample then because it's been truthed over years of cropping that, you know, the amount of nitrogen that's available to a crop in the soil right now, you know, has a -- not a straight line, but has a very direct influence on the yield of that corn crop for the rest of the season.

So there are definitely cases for taking more soil samples than just a fall soil test.

Q In terms of what you've described as field swapping and you also, I think, a little while ago were providing some insight into what types of things can go wrong on an application field, whether there was disease or the crop didn't take for a variety of reasons, and then that leaves you with your fall snapshot sample.

If you don't have a spring sample and you're only making assumptions, how do you account for those different things?

How do you account for the fact that last year you may have had corn, but this year you have grass or vice versa, if you're not using the data that you're collecting then?

A I think on the east side, there's a definite benefit to doing that. You know, the numbers we're seeing, you know, are a big component of what goes into a nutrient budget.

I just feel on the west side, the benefit is not there for the cost and the time taken to sample them.

Q Okay. And I believe that Ms. Nicholson took you through the Cogger paper, and you are aware that Cogger does say take samples, if at all possible, before October 1st?

A Yes. The Cogger paper was also addressing Western Oregon as well as Western Washington, and those other states are significantly earlier than ours.

And, yeah, I think, you know, if you got your crop off before October 1st, then that's great, but within that same paragraph, it's saying "prior to significant fall rains," and I think that, to me at least, is the trigger.

Q So -- and, well, let's just go ahead and look at that. Cogger is R-12, I believe. Yes. So R is the smaller book, yeah. Thank you.

A Is there one more small book?

Q Yes, there is. It's another one with a green cover.

A Got it.

Q On Page 2 at the bottom there, in the second column just underneath the sentence that I just cited about the

October 1st date, that paragraph starts off, "Collect samples from medium to fine textured soils prior to five inches of cumulative rainfall."

And then the paragraph continues to the top of -- to Page 5 to the top of that column there, "and in sandy loamy other type -- soil types, you're looking to collect samples at three inches of cumulative rainfall."

A Yes.

Q So when you're talking about your experience in Western Washington, is that based primarily in areas where soils are the medium to fine texture soils?

A It's everything we've got. We've got a mixture of soils over here that go from very heavy clays to sandy gravelly piles, so it's -- you know, it's over the mound.

Q So the sandy and gravelly types of soils you would want to be collecting for three inches of cumulative rainfall, not five, correct, based on this guidance?

A Yes. I think you also have to take into account your cumulative -- not just cumulative rainfall, but use as well because it's not rare to have a September where you've actually got a crop growing in the field using more water than has actually been received by rainfall.

We may in some Septembers get as much as three inches of rain, but we've also got crops that can utilize that. And so it's -- even in a relatively wet September,

it's not unusual to see fields that, you know, take a one-foot soil probe and find that it's still dry at the bottom inch or two of the probe.

Q Mm-hm. Okay. Thank you.

So I want to talk for a moment about the ARM, which, again, was application --

A Application risk management.

Q -- risk management. So back to your report, which is I-4, I see you begin discussing that around Page 17. And, actually, I might have you turn directly to Page 18 because that's mostly where I wanted to talk about it.

And if I could ask you to have that -- have the permit perhaps where you can refer back and forth, I know it's a bit of a juggling act up there. So, again, the permit is R-2.

A Okay.

Q So I heard you mention that the ARM program has been published in the Journal of Environmental Quality?

A There was an article about it that -- it wasn't specifically about the ARM program. It was also -- it was a consideration of it amongst five others, I believe, that -- from different states.

Q Did that article present any data derived under an ARM example?

A I don't believe it did.

Q Okay. Thank you.
A I don't believe it -- yeah. I don't think there was specific data included. I think it was just comments about --
Q Okay. If we're looking at Page 18 here, I want to walk through some of these because I'm trying to get a handle on what type of information that you gather to utilize the ARM system that would be incompatible with either T-sum 200 or the permit.
A I think that's my point, is that it's not incompatible. I think it's very compatible with the permit in terms of looking at water quality protection.

You -- the first step of ARM is, there's a website associated with it with a map of the western side of the state with -- that's linked to normal weather forecasting data and basically colors areas of the western side of the state, either green, yellow, or red.

It's this traffic signal approach that you -- a good day to apply or not or one where would apply but apply with caution.

And then the request is to go out into the field to assess the crop and assess the field conditions. So it -- also within there, there's a little instruction about how to assess the moisture holding capacity of the soil and how wet the soil is, ask you to dig down to see

how deep, you know, the groundwater is in the field.

On that day it asks you about the proximity of surface water, asks you to assess the cover the crop gives to the soil.

So in terms of a percentage of covers, if you've got a sparse crop that, perhaps, wouldn't let -- wouldn't hold the liquids so well or a dense cover, that would prevent movement so much.

Q So are -- all those things you just listed, do you consider those good management practices for any agricultural operation?

A I do, yes.

Q Would that be something that you would have recommended to your clients prior to that particular ARM program being developed?

A It's certainly something that I look at with producers in spring applications and looked at before ARM came along.

I think the attraction to ARM is that it includes this very visible weather forecasting tool, and it -- and it gives us some sort of semi-formalized approach to going down the checklist of, "Have you done this, this, and this?"

Q In terms of -- well, you had mentioned that you were here for two weeks ago during the hearing.

A Yes.

Q Did you -- do you recall hearing anything about the Manure Pollution Prevention Plan?
A Yes.
Q As a site-specific way that a particular operator would customize their management practices to address and meet the conditions in the permit?
A Yes.
Q So, again, that list that you enumerated for us, would those be the types of things that you would recommend someone to include in such a plan?
A They could include it in the plan, yes.
Q Okay. Oh, you mentioned the depth to water table. I think we had some conversation about that.

In your experience in Western Washington, is the depth to water table at a dairy or land application site difficult to ascertain?
A Takes a shovel and a little bit of time to dig down in terms of -- that's an oversimplification. It's a very site-specific thing.
Q Mm-hm.
A Digging down the first couple of feet with a shovel is a piece of cake.

What the ARM program is looking at is trying to make sure that you have a decent depth to groundwater, that you're not -- once they -- depth down and finding you've

got that level of saturation in the soils.

Generally, I give up digging when I get down to about three feet. It's -- yeah. So it's not unusual to have one field on one farm have, you know -- be within a foot or so of groundwater and in other fields that you can dig down three feet and not find anything.

Q Thank you.

If I could ask you to look at the permit at Page 21, so R-2. So I'm looking in Section 3D, the application restrictions.

A Yes.

Q They start there on 21. Again, some of these are starting to sound familiar from your list in terms of not applying to fields with saturated soils, if the water table is within 12 inches of the surface, precipitation forecast.

Seems to be very similar with some of the factors that you named off for us.

A Yes.

Q Okay. In terms of your conversation about the adaptive management table, is it your understanding of the permit that the adaptive management actions that this table stands alone to direct a producer or does it work with the rest of the permit?

A I think it -- I think it stands alone in terms of

interpretation of the soil test. I think the other parts of the permit, such as emergency winter application or the cover cropping, double cropping scenario, sort of an addition to that, but they don't sort of excuse you from this. It doesn't act as that.

Q Okay.

A At least in my reading of the permit.

Q Mm-hm. Okay. And, again, in looking at -- when you're proposing to use the fall -- the results of fall soil sampling without a spring soil sample, how are you accounting for the changes -- how are you, first of all, incorporating the fact that, say, "This year say we had a soil sampling rate of 35, so we're in the high area"?

Do you take that information into account when you're putting your budget together?

A That, together with what was the production of the crop through the year. Are there reasons -- you know, what are the reasons we got to that level? Yeah. And then taking that into account.

I mean, if it's a field and we've been under-accounting for mineralization, we need to -- we need to, you know, address that or if there have been yield factors or quality factors that have affected that.

Q So how would you determine -- since you said that that quantifying mineralization was still elusive, how do you

determine that you have maybe under-accounted for mineralization or over-accounted for it?

A Well, one of the things that's required under the permit and under the Dairy Nutrient Management Act is that you keep a record of what you apply to a field during the year.

So in a way, it's -- it's the reverse of the budgeting process: What have we taken off the field? What's the nitrogen that has been pulled off the field in the year? Maybe what has been locked up and tied up in establishing that perennial crop?

But then subtracting out what did we apply and did we apply too much because now we have what's left is -- has come from the soil. And have we -- did we not account for enough mineralization?

And, you know, that's a very field-specific thing. Yes, it will change from year to year, but it also changes from field to field, so maybe moving forward, we should be accounting for 20 percent extra or mineralization for a future year, especially if we're getting high numbers as a result.

Q And when you're putting together a field budget and calculating -- well, the permit uses the term application rate, but to go to the term that Ms. Nicholson asked you about, your agronomic rate, is your primary goal at that

point maximum yield for the crop?

A It tends to be -- it's not specific -- it's not always maximum yield. I mean, yes, farmers tend to like to get the best they can out of their fields, but there's also a quality aspect to that.

And there may be -- there may be other parameters. I mean, in years like this, where people aren't making a lot of money dairy farming, they don't want to be going out and spending a lot of money on commercial fertilizer.

So the aim is not what's the -- what's the maximum yield we can achieve. It's more, what's the best we can achieve with what's sitting in our lagoons and our dry stacks.

Q And I believe I heard Ms. Nicholson ask you if you believe that the ARM program was protective of groundwater and surface water.

A Yes.

Q And your answer was?

A I believe it is, yeah.

Q And yet I haven't heard you speak about groundwater in relation to that.

We looked at some data with regard to shellfish beds and surface water, but what do you base your opinion on, that it's protective of groundwater?

A Well, we've been talking about the Blaine-Sumas Aquifer,

and I'd always known it as the Abbotsford-Sumas Aquifer. A big chunk of it sits under Canada as well.

And there was a cross-border symposium years ago about groundwater, and there was some very clear indication there from hydrogeologists that the -- what they call the age of the groundwater there was -- they said between -- I think the number that comes to mind was 16 years and that the -- putting into place practices today would need to be a continuation of those practices of over many years to see the groundwater impacted, that it would take years of following these standards.

So as a result, Department of Ecology had been sampling these wells in the Sumas-Abbotsford Aquifer for years.

And the latest study that's come out of there is showing that, sure enough, as was expected, that the numbers are slowly improving.

Q And what study is that?

A That was -- it was a Barb Carey survey of water in the Abbotsford-Sumas Aquifer. It was data that's been on the EIM site -- the ERM, the Ecology data repository. All that well data is in there, and she produced a summary of that data last spring, I think.

MS. BARNEY: Okay. Thank you. Just taking one last look.

That's all I have. Thank you.

JUDGE FRANCKS: Okay. Ms. Matsumoto, can we take a ten-minute break before you start?

MS. MATSUMOTO: Sure.

JUDGE FRANCKS: Thank you. Be back at 2:45.

(Recess taken from 2:34 p.m. to 2:48 p.m.)

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

MS. BARNEY: Your Honor, if I may, I neglected to move for the entry of the -- as an exhibit of the prior version of Mr. Haggith's testimony that I passed out to everyone, and I'd like to do that at this time.

MS. NICHOLSON: We're going to object to that, Your Honor, because he did produce the updated report everybody has had for -- since March.

JUDGE FRANCKS: I think, because we talked about it here and because he had to address it, I'll go ahead and admit it.

What are we going to mark it?

MS. BARNEY: R-28, I would suggest.

(Exhibit No. R-28 admitted.)

MS. BARNEY: Thank you, Your Honor.

JUDGE FRANCKS: Okay. Ms. Matsumoto?

CROSS-EXAMINATION

BY MS. MATSUMOTO:

Q Hi, Mr. Haggith. We met at your deposition. Nice to see you.

I have a few questions for you.

You mentioned that you work for N3 Consulting; correct?

A Yes.

Q And who are your other partners with N3?

A Well, we started out with four of us. Nguyen Matthews, who subsequently left us to go and head up the CAFO program down in Oregon for Oregon Department of Ecology; Joy Holly, who subsequently left us to go and work for NRCS in Whatcom County; and Fred Likkel, who has now gone part-time.

Q And Mr. Likkel also is affiliated with the Washington State Dairy Federation; isn't that correct?

MS. NICHOLSON: Objection. Relevance.

MS. MATSUMOTO: There is an appellant here today, and it's a partner that Mr. Haggith has worked with.

A Yes. We did some --

MS. NICHOLSON: No. You wait until she's --

JUDGE FRANCKS: I'm going to sustain the objection. I'm not sure that we need the associations of a partner who's not involved in this.

So with that, you can move on.

Q (By Ms. Matsumoto) Mr. Haggith, we've already discussed somewhat your updated report and some differences between your initial and updated report.

And just to get the timing correct, you had submitted this initial report and then we had a deposition.

Do you recall about how much time we spent in deposition?

A Four hours or so, yes.

Q Mm-hm. And then you produced your updated expert opinions, correct, following the deposition?

A Yes.

Q Ms. Barney pointed out some changes beyond just the addition of data, and I'd like you to look at your initial report, just the executive summary Item A. And that is Exhibit R-28.

A Okay.

Q And the last sentence ends with the phrase "otherwise reasonably simple process." And if we -- do you see that?

A Yes.

Q Okay. If we compare that to your updated report, Exhibit I-4 --
A Yes.
Q -- I noticed you added an additional clause at the end of Paragraph A there that includes the phrase "protective of groundwater"?
A Yes.
Q And do you recall if that's the first time you've ever used that phrase in the context of your expert opinions?
A No. I don't recall.
Q Okay. Would it surprise you to learn that this is the first time that that phrase has appeared and it didn't appear in your initial report?
A I don't think it would surprise me, no. I don't think so.
Q And is it -- but is it still your opinion that the only changes from your initial to the updated report centered around just the data?
A I mean, what I was trying to achieve was some clarification on a -- seemed to be around this data and this whole idea of the spring soil sampling because that was where a lot of questioning went in the deposition.

And I felt that I didn't come off particularly clear in the deposition in my conclusions and my thoughts there. And, you know, just leaving that sentence as it

was with the variations in soil sampling complicating an otherwise reasonably simple process, well, you know, who really cares whether it's complicating a simple process?

I think that the point is more that we're trying to protect groundwater with the permit and trying to see if there's actually a point of spring soil sampling in terms of protecting groundwater.

Q And so you agree that's an important goal of having the permit is water quality?

A Oh, yeah. Well, that's what the permit is about, yes.

Q Looking at your data set, in the notes column, there are, it looks like, four entries that have a note that says "not CAFO."

Do you see those?

A Yes.

Q And the highest one, I believe -- or if you look at Page 4 -- and let me back up just a second.

Is it correct you've organized these in terms of lowest to highest spring soil nitrate level?

A Spring soil available nitrogen level, yes. Combination or an addition of nitrate and ammonium.

Q So we can see the first data point starts at 3.8, and it goes all the way up to 33.1 in ascending order; correct?

A Yes.

Q And so the sample that the data point on Page 4 that says

"not CAFO" has a spring soil available nitrate level of 13.9?

A Yes.

Q And the other three samples that are not collected from the CAFO have spring levels that are less than that; correct?

A Yes.

Q And looking at Paragraph 4 of your report, Ms. Nicholson was asking you some questions with the visualization of these samples broken out into bar graphs.

And you had referenced in Paragraph 4, 20 milligrams per kilogram of available nitrogen sort of cutoff.

Do you see that in Paragraph 4 towards the end of the paragraph?

A Yes.

Q And so including these four samples not collected from a CAFO means that you have four additional data points that are below 20 milligrams per kilogram; correct?

A Yes.

Q So you've selected to include those results in a way that favors your conclusion?

MS. NICHOLSON: Objection. Argumentative.

A Well, four --

JUDGE FRANCKS: I'm going to allow it.

A Four out of almost a hundred. Yes. I've included them.

One of the things that was being angled at during my deposition was that it wasn't a complete data set, and these are all the soil samples I took.

Q (By Ms. Matsumoto) But those four that were not collected from a CAFO, it appears that they skew the results to favor the conclusion of having a majority of samples under 20 milligrams per kilogram in the spring?

MS. NICHOLSON: Objection. Argumentative.

JUDGE FRANCKS: I'm going to sustain that one.

Q (By Ms. Matsumoto) Mr. Haggith, you would agree that, for all of the data points that you have included in your table, when you have a fall sample to compare it to, it would give you or the producer a better understanding of how their system behaves; isn't that correct?

MS. NICHOLSON: Objection. Misstates testimony.

JUDGE FRANCKS: Can you rephrase?

MS. MATSUMOTO: Yes.

Q (By Ms. Matsumoto) Don't you find it useful to be able to look at samples collected from the same field year over year -- over time so that you can get an understanding of how the field works?

A Yes. I think yes.
Q And so that would include having past samples from that field, fall samples, samples from a year ago in the spring, whatever you have to look at?
You would agree that that's informative to the farmer to get a better understanding of how their field is functioning?
MS. NICHOLSON: Objection. Misstates testimony.
JUDGE FRANCKS: I think he can answer that.
A I think a soil sample is -- it's a snapshot in time. It gives you an idea of that nitrogen concentration in the soil on that day without other information in terms of the cropping, that it has limited -- it has limited value.
Q (By Ms. Matsumoto) And so if a person has just a spring sample or even just a fall sample in isolation, would you agree that they don't have as clear of a sense of how their field and their cropping is functioning on that field as someone who had, let's say, three or even five years of regularly collected spring and fall soil samples?
MS. NICHOLSON: Objection. Compound.
JUDGE FRANCKS: I think he can answer

it.

A I think all these soil samples are aimed at different things. The fall soil sample is -- as I said earlier, it's described by many as being that report card test that you're showing how you've performed in the year against that budget, how well that manure has been used as a fertilizer source, as a feed source for the crop.

The spring soil sample has none of that history because it's -- it's -- you're coming out of the winter. The point of including this data set was to show really there's nothing like the variation in the spring that there is in the fall.

And I think, you know, that spring clean of non-CAFO fields through the -- through -- within this CAFO information just goes to strengthen that argument.

Q (By Ms. Matsumoto) So you -- it's your testimony that there is greater variation in fall soil sampling than there is in spring; is that correct?

A There's a greater level of variation, and there are a greater number of environmental and human factors that go into that variation.

Q And looking at this data set, it appears that there are quite a few gaps for fall soil samples. Many of these data points are actually lacking that fall data.

So where are you -- from what information are you

reaching that conclusion?
A From which conclusion?
Q That there's more variation in the fall soil sampling when it appears that a significant percentage of these data points don't actually have a fall soil sample to reference.
A The fact that there is -- you know, I'm basing that on of many years of experience of taking these fall soil samples and spring soil samples that there's great variation, and there's, you know, good number of different cropping reasons that lead to that.
Q Do you know how many of these data points do not have a fall soil sample included?
A I don't.
Q Do you know how many total data points you included in your summary?
A I believe it's 117.
Q Would you accept my representation that it's 125?
A If you say so, then -- I haven't counted them recently, but yeah.
Q I think, if you were to count them, that's about the number you would reach.
And similarly, for the gaps for fall soil samples, approximately 47 appear not to have a corresponding fall soil sample.

Why isn't there a fall soil sample listed?
A I just didn't have it at the time.
Q So you don't know if a fall soil sample was taken and just not included or --
A Correct.
Q -- if there's some other explanation?
A They may well have been taken and -- but not by me. I didn't -- otherwise, I would have included the numbers.
Q And you've talked a bit about mineralization as being kind of the primary driver for available nitrogen in the spring; is that correct?
A Yes.
Q Okay. And you would agree, though, that whether the nitrogen that's available in the spring results from mineralization or some other reason, it's still available to the crop; correct?
A Yes.
Q And so because it's crop available, it's important to account for it in the nutrient budget?
A It's -- my previous testimony was that, you know, it's part of that mineralization within the soil, yes. The mineralization should be accounted for in the nutrient budget.

Whether it's occurred by the time you get into the field to take the soil sample or not is -- is academic.

It doesn't change the fact that mineralization is occurring. I don't think you can reduce or increase your estimation of mineralization for the year based on that sample.

Q And some of these samples also in the crop column do not appear to have a crop listed.

Is it correct that, if it says "none" in that column, it means there was no crop planted over the winter?

A Yes.

Q And I'd like you to look just at Page 4, about two-thirds of the way down. There are three samples collected in Skagit County from farm identified as No. 4 and then in the field column listed 4, 6, and 7 taken -- all taken on April 28th.

Do you see those?

A Yes.

Q Right. And they don't appear to have had a crop planted over the winter; correct?

A Yes.

Q And when you look at the fall soil result, each of the three appears to have a fall soil result included.

That number is higher than the available spring nitrogen result; correct?

A Yes.

Q And as you've already testified, nitrate is -- there's a risk that nitrate can be lost once -- if it's not taken up by the crops?

MS. NICHOLSON: Objection. Misstates testimony.

JUDGE FRANCKS: I'll let him answer.

A Sorry. Can you --

Q (By Ms. Matsumoto) Sure. Well, we talked a lot about plants using nitrogen, and Ms. Nicholson kind of walked you through Table 3, and you mentioned some risks.

And I think one of the risks you mentioned was that nitrate that isn't taken up by the crops could potentially move down to groundwater; is that correct?

A It's one of the things that can happen with nitrate, yeah, amongst others, yes.

Q Okay. And if you see a fall soil sample taken from a field that is higher than a spring soil sample, taken from that same field in an area where a high precipitation is known to occur, one possibility is that the difference in those two numbers could represent the amount that's being leached down to groundwater; isn't that correct?

MS. NICHOLSON: Objection. Compound.

JUDGE FRANCKS: I think he can answer.

A I think there are, you know, a variety of different

potential reasons why it's reduced over the winter.
Q (By Ms. Matsumoto) But I'm just asking about this one -- this is one possibility; correct?
A This is -- it's certainly moved out of the top foot. Whether it's leached all the way down to the groundwater, that's -- refer to previous testimony on that. I'm not a hydrogeologist.
Q If -- when it moves out of the top foot, it's moving past the root zone, then there is a high risk that it is moving into the groundwater; correct?
MS. NICHOLSON: Objection. Been asked and answered.
JUDGE FRANCKS: I don't think so.
A I think limiting the root zone of a crop to the top foot is unfair. The crop roots go a lot deeper than just one foot.
So, you know, if it drops out of the top foot, it still may well be accessible to crop rooting.
Q (By Ms. Matsumoto) If it continues to drop such that it's past the root zone, you would agree that it could reach the groundwater; correct?
A I -- again, whether it reaches groundwater or not is not my area of expertise. I would leave that to a hydrogeologist.
Q But you --

A Touched on that in his testimony with far more experience and knowledge than I ever could.
Q Your new report adds the phrase "protective of groundwater," and just a few moments ago you mentioned that that was an important function of this permit, was protecting groundwater, so --
A Yes. And I believe that, if we're applying it at an agronomic rate and we're applying to crops such that they can take up what they need and not overapplying, that we are protective of groundwater.

And I believe that that's borne out with, you know, this sort of water quality data we're getting from Ecology on the Sumas aquifer.
Q But you agree nitrate is soluble and moves with water; correct?
A Yes.
Q And so there is a risk that, if nitrate is moving with water and it moves past the root zone, that it will eventually reach the groundwater; correct?

MS. HOWARD: Objection. That's been asked and answered.

MS. MATSUMOTO: I don't think I got a clear answer on the question.

JUDGE FRANCKS: I think he can answer it.

A I think there is a -- there is a risk. Whether it actually happens or not, I can't answer that.

Q (By Ms. Matsumoto) Thank you.

You mentioned that there has been an increase in cover crops in recent years. I believe Ms. Nicholson was asking you some questions about Table 3 and the permit requirements for cropping and perennial crops?

A Yes.

Q Do you remember that? Isn't one reason for having a cover crop so that a farmer can deal with excess manure?

MS. NICHOLSON: Objection. That misstates testimony.

MS. MATSUMOTO: It's just a question. I'm not trying to rephrase the testimony.

JUDGE FRANCKS: He can answer that question.

A No. The thought behind cover cropping -- cover cropping has huge advantages all over the nation and is being promoted by just about anybody who has anything to do with cropping from the society of agronomy to NRCS and conservation districts because of its assistance in holding soil on fields where there's erosion and, in the case of our situation, in capturing nutrients that are there in the fall and utilizing them.

It generally -- in terms of nutrient budgeting and

nutrient management, developing of nutrient management plans, there's some fairly big discussions about whether those cover crops should actually be accounted for in nutrient budgeting, whether they should be just in addition to the existing system.

So they're not used -- you talk about excess manure. The dairy nutrient management plans -- the MPPPs are all asking you to make sure your crops are in balance with the level of nutrients that you have on the farm.

So, you know, excess manure is not what the cover crops are there for. They're there to help stabilize the soils and help produce more food from the nitrogen that you've got available to you in the manure.

Q (By Ms. Matsumoto) They can still perform that function, though, correct, of being a way for excess manure to be used in some way that's not just simply being stored in the ground?

A It's rare that you see people applying to cover crops in the fall. Generally, they're established. They may be manured in the spring or fertilized with commercial fertilizer in the spring in order to bring them to a fully healthy harvest.

But, you know, if you're suggesting they're a dumping ground for this excess manure, I don't believe it exists. I don't think that's the case.

Q You don't believe that farmers struggle with issues of excess manure?
A I -- it -- the whole dairy nutrient management planning process is about making sure there's a good balance of crops and crop needs to the nutrients in the lagoons. The vast majority of clients I work with are having to buy fertilizer to round off that balance.
You know, the cows eat an awful lot of food, but they need a lot of crop ground to feed them. Manure is part of that system.
Q And most of your clients, you said, are dairy farmers?
A Yes.
Q And do you know how many that is in terms of the number? Did you mention that earlier?
A I don't think I did mention that earlier, but -- I should have tallied it up, but it's more than 60.
Q And have you spoken with many of your clients about pursuing coverage under the CAFO permit?
A Yes. Yes.
Q And isn't it true that most of them are not interested in pursuing coverage under the permit?
A There's a stumbling block, and part of the stumbling block is this appeal and why would you sign up for something when you don't know what it looks like.
You're signing -- you're signing on to a serious

document when you sign up for the CAFO permit, and it has some far-reaching implications, and cost of implementing it are not insignificant.

For some, it comes down to a decision of, well, do we apply for the permit? Can we afford to apply for the permit? Do we retire?

It is -- if you've got a dairyman in his 50s who's got nobody from the next generation to follow him on and kind of feeling in his heart like it's a good pursuit for his sons and daughters to follow, then he's looking at -- you know, if he's backed into a corner and has to fulfill the requirements of the permit and that means rebuilding lagoons with the cost of hundreds of thousands of dollars, then he's going to sell the herd and move on. It's not worth that level of investment.

Q How many of your clients are applying commercial nitrogen?

A Quite a lot. Can't give you an exact number, but I'd say that at least -- at least 50 percent are buying in some level of commercial fertilizer to -- you know, to finish off and round up their nutrient applications.

Q And that's at least 50 percent of your dairy clients?

A Yes.

Q And are you recommending that they apply commercial fertilizer?

A When they need to. I mean, if they haven't got enough nutrients in their manure, then, you know, the decision then is, well, do you short your crop? Do you accept that you're going to get less yield or do you invest in some level of commercial nutrients to improve that?

We've also got, you know, organic dairy clients, and in more cases than not, they're growing some of the vigorous looking grass because they can't get their hands on commercial fertilizer, and actually getting their hands on organic manure sources that have any decent level of nitrogen in them is very difficult.

Q You talked a little bit about the nutrient budget process.

Do you recall that?

A Yes.

Q And if you look at Table 3, either right there behind you or we can pull up Exhibit R-2 permit.

A Yep.

Q Okay. And you had some concerns about you referenced kind of the bureaucratic nature of having nutrient budgets approved by the Department of Ecology?

A Yes.

Q But that's -- if you look at Table 3, not a requirement in all cases, is it?

A No.

Q So it's only in the limited instance where a fall soil nitrate test is at -- is above 45 parts per million; correct?
A Correct.
Q And so in that situation, you wouldn't recommend that an operator apply in that case anyway, would you?
A The nutrient budget is for the following year, so, yes, I would put together a nutrient budget that would look at the crop needs for that year and where those needs were going to be met from.

I can see Department of Ecology's thinking that they'd like to see those budgets, and undoubtedly those probably need more scrutiny than ones from the fields that are -- that have lower nitrate, but I -- I think to have to wait in order to implement that budget, that's my issue there.

I think the budget needs to be crafted carefully, and it needs to be crafted looking back at that prior year and what led to that high level of nitrate in the fall.

So that's -- so I'm not saying we shouldn't be accounting for that. I'm saying that we should be very careful but that I don't think that that -- that holdup and the reduction in yield that can follow from such a holdup is helpful.

In fact, quite the opposite. If we're getting less yield off a field, then we're going to -- and we don't reduce the amount of application, we're going to see high nitrates. And if we start doing this too much, it's going to be a spiral downwards.

So I think it's something that's -- needs to be addressed carefully, but stalling the process of management in that field is not good.

Q But that's only in the very high field risk level, which, you would agree, ideally is not the target risk level; correct?

A It's absolutely not the target risk level, but there are reasons why it would happen in a year, and it's not necessarily through deficiency of a nutrient budget. It could very well be through climatic factors or disease factors within that field for that year.

And something that needs to be accounted for undoubtedly and is accounted for in those end-of-year reports that are submitted by December 31st.

They have to account for every field that has come up with a very high soil test number. So you're already going through the thought process, and Ecology has already been notified of that being a high field and of the -- your reasoning behind that.

So they've had the information. They've got the

ability to address those issues and talk with you about it before you even start to put a budget into place the next year.

So I think then stalling the whole process around budgeting and, therefore, impacting crop yield as a result, I think, is unnecessary.

Q But as someone who advises farmers on those four R's you mentioned, right place, right time, it would be your hope, would it not, that a farmer finding him or herself in that category would be the exception rather than the rule? Correct?

A I would -- yes. Yeah. We -- that would be the aim. We're not aiming for those sort of levels of nitrate in the fall.

Q Right. And the accompanying required actions in the adaptive management table; right?

A Yeah.

Q Right. You also spoke a bit about winter manure applications and that you would hope that they would be applying to dry fields. Is that what you said earlier?

A Yes.

Q And that's because having applications on saturated or frozen fields create risks of runoff; correct?

A Correct.

Q Are you aware or have you ever been involved in

responding to any instances of significant runoff that resulted from an emergency application or other emergency winter condition?

A Emergency -- yes. I've been involved in follow-up from those sort of events, yeah. Yes.

Q And what were those? Can you remember any specific examples?

A When you get -- well, a winter like the winter of 2016 to '17 where we got more than a year's worth of rainfall in five and a half, six months of winter storage season -- so people were absolutely crammed to the top of their lagoons -- there were -- there were a lot of people who were looking for where could they go with the manure to make sure they didn't have lagoons running over and make sure they weren't impacting surface water.

Q How about other examples prior to last year?

A I think there have been events, yeah. There have been times when emergency application -- the reason I think that it's written into the permit is, it happens, and it has to be accounted for.

Q About how many have you been involved in responding to?

A I have no idea off the top of my head. Yes.

Q Did you ever work with the Snook Brook facility in the context of dealing with an emergency winter application?

A No.

MS. NICHOLSON: Objection. Relevance to the permit terms.

MS. MATSUMOTO: There are -- there's a whole section of the permit dealing with emergency winter applications, and Mr. Haggith's response indicates he's familiar with the name.

MS. NICHOLSON: But now they're talking about a specific dairy.

JUDGE FRANCKS: Yeah. I think this is beyond the relevance of the permit.

Q (By Ms. Matsumoto) Mr. Haggith, you were asked about, in the context of Table 3, kind of a hypothetical that Ms. Nicholson offered about one of your clients being in the very high range for three consecutive years, and you said something like, "I think he wasn't listening to my advice."

Do you recall that?

A Yes.

Q And have you actually had clients who have tested in the very high range that's above 45 parts per million or above 165 pounds per acre in the same field for consecutive years?

A Yes.

Q And what advice have you given them in those situations?

A Well, advice I give them. Our focus has been on what's

the crop and what are we trying to achieve there and what's the soil capable of achieving? Because clearly it isn't achieving what's been happening.

As part of what we do with several of the dairies is, we put together records of what's been applied to a field. In those sort of situations, we start to look at them really quite closely and as does Department of Agriculture and their inspectors.

Those are the fields that they look at most closely are the fields that are over 45 parts per million in terms of what's occurred with the nutrient balance.

So the recommendation is, you know, flow from that, is it time to reseed the grass field? Is it just not producing what we thought it would be producing? Is it -- is it time to be backing off further on manure applications or on commercial fertilizer applications?

Are the times just wrong? You know, what's -- what's been happening in the field? So it's a big question. Sometimes the answers are simple. Sometimes it is just, "Let's apply less and see what happens."

But sometimes it does take, you know, some significant investment in reseeding a field or sub-soiling a field or making some other large changes.

Q And one of the other things you might consider is kind of the climate and whether they're in Eastern or Western

Washington; is that correct?
A That would factor in as one of the factors, yes.
Q And you worked for dairies on both sides of the state; correct? Eastern and Western Washington?
A Yes.
Q And in Eastern Washington, you worked for Dan DeRuyter at one point. Is that the --

MS. NICHOLSON: Objection, Your Honor. Relevance.

MS. MATSUMOTO: We've already talked about the DeRuyter dairy in the past week that we've been here. And it's a specific example.

Mr. Haggith has already used many, many data sets from his particular clients without giving us any identifying information as to who they were, but we have the opportunity to look at some real-life identified information about a client that Mr. Haggith has advised in the past.

JUDGE FRANCKS: And what -- but what's this relevant to in our issues?

MS. MATSUMOTO: Table 3 and Mr. Haggith's prior testimony about recommendations he may or may not make.

JUDGE FRANCKS: I think this is beyond the relevance. I don't think his advice to a particular

client is relevant to the permit here.

MS. MATSUMOTO: To the extent that they inform his opinions about whether the permit terms are adequate enough, he's already said that, you know, his own experience being on many dairy farms in the past has informed the basis for some of these opinions.

JUDGE FRANCKS: I think it's beyond the relevance.

MS. MATSUMOTO: And Mr. DeRuyter's performance has already been testified about, and this goes to Mr. Haggith's credibility and his role as an advisor to that facility.

JUDGE FRANCKS: I think -- I still think it's beyond the relevance of the issues that are before the board today.

MS. MATSUMOTO: One moment. Just for the record, I'd like to make an offer of proof that, if we were allowed to further explore this area of inquiry, we'd be able to present the board with a little bit more information about Mr. Haggith's expertise and his credibility as someone in this particular field.

And that is it for me.

JUDGE FRANCKS: Okay. Ms. Nicholson, redirect?

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REDIRECT EXAMINATION

BY MS. NICHOLSON:

Q I just have one quick redirect question, Mr. Haggith.

Over the course of your career, how many fall soil samples have you taken, do you think? Just a rough estimate.

A Ten to fifteen thousand.

Q And are your opinions about fall soil samples based on those 10- to 15,000?

A Yes.

MS. NICHOLSON: Thank you. That's it.

JUDGE FRANCKS: Board questions? Who wants to go first? Mr. Wise?

EXAMINATION

BY MR. WISE:

Q Good afternoon. I just had one question.

Now, when you're doing your field budgets and trying to figure out the agronomic rate and all that, how confident are you that you're hitting the mark?

I mean, do you have any way of -- do you do any follow-up to verify that you're putting the right amount of fertilizer on to not overwhelm the plant uptake?

A Yes. It's a factor of history really. We look at what the fields -- how the fields have been performing in the past. We also look at -- when we've done that whole farm

balance, we know we're in the ballpark.

And so then working from field to field, need to take into account field history in order to put that into place, and then you need to follow up.

That Pre-Sidedress Nitrate Test I was talking about earlier that's on the corn crops, at least that's a good opportunity to take another soil test and say, you know, "How well have we done in feeding the crop to this point?"

And then you also look at that fall soil test result to say, "Did we meet the mark? Did the plant take up what we gave it?"

And it's -- so it -- the first year that you're on a new farm with a new client, it's a bit more difficult because you working with information -- with limited information.

But once you get a few years into the process, you will be looking back and looking at what's been the history of fall soil nitrates in the field and how closely you have been hitting the mark.

MR. WISE: Thank you. That's all I had.

EXAMINATION

BY MS. MARCHIORO:

Q Thank you. So a while back you were answering questions

from your counsel with respect to ARM.
A Yes.
Q Okay. And one of the things I recall you saying was that you were trying to make certain that you have decent depth to groundwater.
Do you remember that?
A Yes.
Q Is that in terms of separation between where you're applying manure --
A Yes.
Q -- or the liquids onto the field and where the groundwater is?
A Yes.
Q Okay. And why would you want to have a decent depth between those two?
A It's a risk factor really. I mean, if you've got -- if you've got a saturated top foot particularly, then you really don't want to be applying to that field.
The risk of movement in nutrients and of -- and of pathogens and the manure itself is too high, particularly when you're in the spring, when we're hoping -- we need, not just a holding capacity for that manure, but also for any subsequent rain that might fall.
So it's not just that the groundwater is right there and the manure is above it. It's also we might get more

rain and where is that going to go?
Q So wouldn't the same concept apply to a lagoon, that you want a certain amount of separation between the bottom of the lagoon and groundwater because you're going to have the ability for, whether you want to call it leaky or seepage, but that water could be filtrating down and in a lagoon, you've got to even up -- you know, you've got the head. You've got all sort of different things.
You want to protect that groundwater; right?
A I guess so. I just -- I'm not a lagoon expert really that -- where we've been looking at groundwater on -- under ARM, it's been very specifically, is it in -- is it so close to where you're going to be putting the manure that either the groundwater could rise and it could be contacted or the, you know, subsequent rains could inundate the field as a result of your application and you end up with runoff?
Q Wouldn't you also have not just runoff, you also have seepage, right, down to the groundwater on the application to the field if it's saturated?
A Yes.
Q And that same concept applies whether there is a lagoon or whether you're sprinkling the manure?
A Yeah. Other than, you know, in the soil itself, you're talking about a fairly -- you're talking about a lot of

air spaces on the compacted soil.

So there's, you know, the -- the opportunities for movement within the soil are different from the lagoon compacted liner, I imagine.

MS. MARCHIORO: Thank you.

JUDGE FRANCKS: Questions based on the board questions?

MS. NICHOLSON: Nothing.

JUDGE FRANCKS: Ms. Matsumoto?

MS. MATSUMOTO: None from me.

JUDGE FRANCKS: Thank you very much. You are excused.

Ms. Nicholson, do we have another witness?

MS. NICHOLSON: We do. I would like to call Dan Wood.

JUDGE FRANCKS: The court reporter is going to swear you in.

DAN WOOD, having been first duly sworn by the Certified Court Reporter, testified as follows:

DIRECT EXAMINATION

BY MS. NICHOLSON:

Q Good afternoon, Mr. Wood.

A Good afternoon.
Q What is your current title?
A I am the executive director of the Washington State Dairy Federation.
Q And how long have you been with the Washington State Dairy Federation?
A Since January of 2013.
Q And before that, where were you?
A I was with the Washington State Farm Bureau.
Q And how long were you with the Washington State Farm Bureau?
A About 15 years, with a few years in the middle of that as the county commissioner down in Grays Harbor.
Q I would like you to pull up Exhibit I-10 and look on Page 6.
A Lot of open binders here.
Q Yeah. So I-10 is going to be in the big binder. Let me know --
A Tab 10, you said?
Q Yes. I-10. Page 6. And that should be the expert report of Dr. Neibergs.
A It is, yes.
Q Okay. Dr. Neibergs included a little figure there at the top. It's Figure 5.
Do you see that?

A Yes.
Q I just thought that might help you over this next question I have.
Over the first week's testimony, we heard quite a few different estimates of the number of dairies in the state.
Can you clarify for the board how many dairies are there in Washington?
A The Department of Agriculture reports there are 377 dairies.
Q 377 dairies. And how many of those are CAFOs?
A They report by range, and 147 of those are 199, so that would leave 230.
Q 230 that are CAFOs. Okay. Thank you.
Now, has the number of dairies decreased over the years?
A Yeah. In 1993 we had 2,500 dairies in Washington State, and so we have lost 85 percent of our dairies in the last 25 years.
Q You testified that we have 377 dairies in the state.
How many of those must comply with the Dairy Nutrient Management Act?
A 100 percent of them.
Q Regardless of size?
A Correct. Even if they have just one cow.

Q Is there any evidence that the majority of dairies in this state are complying with the Dairy Nutrient Management Act?
A There is. There is a report from the Department of Agriculture that speaks to that.
Q Could you look at Exhibit I-47, please.
A Same binder?
Q Same binder.
A Okay.
Q And what is that exhibit?
A This is a report to the legislature and other state stakeholders June 2016 from Washington State Department of Agriculture. The title is "Implementation of Nutrient Management Training Program for Farmers."
Q And is this the report that you were relying on, is that the majority of dairies are complying with the Dairy Nutrient Management Act?
A Yes.
Q Who produced this report?
A This was the Washington State Department of Agriculture.
Q And who was it given to again?
A It was presented to the house and senate agricultural committees. They each have slightly different names, but committees with jurisdiction over agricultural issues.
Q Please turn to Page 8 of that report.

A Okay.
Q And can you tell me what on this page supports your statement that a majority of dairies are complying with the Dairy Nutrient Management Act?
MR. TEBBUTT: Your Honor, I'm going to interpose an objection to this exhibit.
Mr. Wood had nothing to do with the preparation of this, and, therefore, there's a lack of foundation. There's no witness from Department of Ag who's testified about how it was done or anything along those lines.
MS. NICHOLSON: This is a public document from -- produced from the Department of Agriculture and presented to the legislature.
JUDGE FRANCKS: Well, are you objecting to the admission of it or for her to --
MR. TEBBUTT: The use of it and any potential admission of it, yes.
JUDGE FRANCKS: Okay. Well, I'm going to allow her certainly to question about it.
Q (By Ms. Nicholson) Okay. Are you on Page 8?
A Yes. So Table 3, which is in the middle of the page there, shows that from -- in this report period, from June of 2014 to March of 2016, that they showed 94 to 96 percent of the dairies in compliance with the Dairy Nutrient Management Act.

Q Thank you.

Mr. Wood, what was Washington State Dairy Federation's purpose in filing this appeal of the 2017 CAFO permits?

A We had some concerns with some aspects of the permit. Our dairy farmers are looking for a permit that is based on sound principles, that is something that can be implemented that will protect the groundwater and surface water.

And there are some aspects of the permit that we think are not possible to implement as it's adopted.

Q And are some of those aspects of the permit regarding soil sampling as we've presented testimony this week?

A Yeah. The soil sampling, the depth and frequency that have been spoken to by some of the other experts and witnesses, the adaptive management, the change in where you measure the vertical separation from the lagoon and the groundwater.

Q Okay. Thank you.

Did you participate in the CAFO permit drafting process?

A Yes.

Q And what -- and how did you participate?

A We provided comments on the preliminary draft, the official first draft, the official second draft, and we

participated in multiple meetings.
Q And could you look at Exhibit R-16, please. And R -- there you go.
And is -- why don't you tell me what R-16 is.
A This is the comments submitted by the Washington State Dairy Federation dated August 29th.
Q So what version of the permit would this have been regarding?
A Based on the timing, my assumption is, this was on the -- on Draft 2, which would have been the third and final iteration that was put out for comments.
Q Okay. Thank you.
And is there anything in those comments that regards manure lagoon design?
A Regarding the manure lagoon design, we have comments about the -- I think we have comments about the lagoon assessment, but in terms of the change of where you measure the two feet of separation, no, that's not in here. That was not available to us in any of the three iterations that were available for comment.
Q Could I have you look at Exhibit R-2 on Page 13. And that's Section S4.B. that should be PDF Page 13 as well.
A R-2.
Q Should be Page 13, Section S4.B, B like boy.
A Yes. Okay. S4.B.

Q Yes. Did any of this permit language come as a surprise to you when you saw the final permit?
A Yes.
Q And what language was that?
A In the second paragraph, there is -- in parentheses, it says, "measured from the outside of the earthen liner."
So it's -- for more context, talks about a minimum of two feet of vertical separation between the bottom of the lagoon, and then the language is added, "measured from the outside of the earthen liner."
Q And did you hear Ecology testify that that parenthetical definition, that the bottom of the lagoon is to be measured from the outside of the earthen liner, that that first appeared in the final permit?
A Yes.
Q And is that your recollection as well?
A That is my recollection. We did not see it in the other versions.
Q So did you have any opportunity to provide comments and feedback regarding this parenthetical definition?
A None.
Q Had you had the opportunity, would you have submitted comments regarding this parenthetical definition?
A Absolutely.
Q And why is that?

A I think this is probably the biggest issue in this appeal. I am -- for a lot of our dairies, what we've heard from our dairy farmers and heard from their advisors, is that they could have a lagoon that is compliant with NRCS standards and functioning properly, no indication of anything otherwise, and because of this change in where you're measuring the two feet, their lagoon would be noncompliant.

Q And do you recall any of the costs you heard testified to about this week about becoming compliant with this permit term?

A There have been a number of costs put out there. For, you know, discussions of a liner, I've heard a figure of 400- to 600,000.

I'm not sure what the costs would be if you had to add a couple of feet of clay and bentonite liner on there and what -- I'm not sure what costs would be involved in losing that lagoon capacity and changing any of your practices, but this is a major cost concern for a lot of dairy farmers.

Q And were you here for Dr. Neibergs' testimony that it could definitely put some dairy farmers out of business?

A Yes. And I've heard that directly from farmers.

Q Okay. Did you participate in meetings with Ecology regarding the draft versions of the CAFO permits?

A Yes.
Q And how many meetings do you think you participated in?
A Oh, I'm guessing half a dozen to a dozen over however many years this process went on. I don't have an exact number.
Q Okay. That's fine. In any of those meetings, did Ecology ever communicate their intention to change the definition of what is the bottom of the lagoon?
A No. Not once.
Q Do you recall any discussion at any point recalling Ecology's specification that -- of the parenthetical definition that there must be two feet from the bottom of the liner?
A No. We didn't -- we didn't see it. We didn't hear of it until after the final permit came out.
Q Can I have you look at Exhibit I-16, please, the big one.
A This will count as physical therapy for my shoulder surgery recovery.
16?
Q I-16, yes.
A Okay.
Q Okay. First, can you tell me what happened when you first saw that parenthetical definition, the bottom of the lagoon, in the final permit?
A Well, it was actually brought to our attention by some

dairy farmers, and I guess our first reaction was that they were misreading it because we had seen nothing of it prior to the final version.

And so we looked, and, yes, indeed, it was in there.

And so we assumed that it was a mistake, so I asked Jay Gordon on our staff to look at it.

Q And have you seen this email before, which is I-16?

A Yes.

Q And did Jay Gordon send this email at your direction when you determined that the definition of bottom of the lagoon had changed?

A Yeah. So this document, if you go to the back of the document, you'll see the email from Jay Gordon, and then you'll see the other folks involved in the conversation.

And Virginia Prest from Department of Agriculture, Larry Johnson from NRCS in Spokane, and Sally Bredeweg from the NRCS Portland.

Q What is your understanding of the response in this email regarding the definition of bottom of the lagoon?

A So the NRCS bottom of the lagoon is the top of the liner, and NRCS has made it clear that that's where they measure for the two feet of separation is, from the bottom of the lagoon or the top of the liner.

Q And once you've had that clarification, did you contact Ecology?

A We did. I believe a phone call was made, just asking them if maybe this was a -- some sort of editing error, and that was our assumption.
Q And did you -- do you recall any response from Ecology on that?
A We didn't get a response right away. And I'm not sure that I recall if we ever did get a response.
MS. NICHOLSON: Thank you.
I would move to admit I-47, Your Honor.
JUDGE FRANCKS: I-47 is admitted.
MS. MATSUMOTO: We'll object as lack of foundation.
JUDGE FRANCKS: I'm going to overrule that. I think he knows enough about it, so I'm going to admit I-47.
(Exhibit No. I-47 admitted.)
MS. NICHOLSON: Thank you.
I believe that's all I have for Mr. Wood at this time.
Oh, before I step down, can I move to admit R-16?
JUDGE FRANCKS: R-16. I-16 or R-16?
MS. NICHOLSON: R-16.
JUDGE FRANCKS: R-16 is admitted.
(Exhibit No. R-16 admitted.)
JUDGE FRANCKS: Ms. Barney?

CROSS-EXAMINATION

BY MS. BARNEY:

Q Good afternoon, Mr. Wood.

A Good afternoon.

Q Since we just admitted R-16, let's take a look at that. These are just --

A The NRCS email or is it --

Q No. This is your comments.

A Okay.

Q So R-16.

A Okay.

Q And I think you mentioned these were your comments based on the timing of the draft, the official draft permit?

A I believe so.

Q Okay. Can I ask you to turn to Page 14 of this document. They're numbered there on the bottom.

A Okay.

Q 14 of 21. And you can see the numbered paragraphs.

Can you tell us what these numbered paragraphs all represent in the document?

A They're referencing sections of the permit.

Q Okay.

A Is that what you're asking?

Q Yes.

A Okay.

Q And so then these are the dairy federation's comments on these specific sections?
A Yes.
Q Could you look at No. 14, please, where it's referencing Page 20 S4.J.7.G?
A Yes.
Q And in that paragraph, you mention T-sum 200 as a standard timing guideline and requested that Ecology change to a standard timing guideline rather than using the terms "spring green-up"?
A Yes. I see that.
Q Okay. Thank you. Thanks. That's all I have in that document.

But if you have the permit available, which is going to be R-2 -- it might be in one of the notebooks behind you, the green spine. Making sure your PT is going to be --

A I'm going to -- should have counted the reps on this, but -- okay. R-2?
Q Yes. I wanted to ask you to turn to Page 36 in the permit. Maybe 35, I guess, in that version. I'm looking for Condition S7.B.
A B, as in boy?
Q S7.B, as in boy.
A So I have it on Page 32.

Q On 32. Yes. I'm sorry. I don't know how all my numbers got off here.

So S7.B, the title there is "Existing Lagoon Assessment"?

A Yes.

Q So I heard you testify earlier that one of your concerns with regard to the vertical separation issue was what a producer would have to do if they had found that their lagoon did not have that level of separation.

Is it your understanding that immediately the lagoon would be required to be replaced or taken out of use?

A No. I don't see that that would be an immediate. Our concern is that, by changing where you're measuring that two feet of separation, that you are deeming the lagoon to be noncompliant under the permit, even though it may meet the NRCS standards, and that, I think, logically leads to a concern of what happens next.

So if you are labeling the lagoon as deficient because of that, that changing of the measuring point, then it naturally follows that some action would come as a result of that.

When that happens, I don't know that that's specified in the permit, but it seems that something would happen.

Q But isn't the action that the permit requires an

engineering report to address the deficiencies? So no specific action is required as a result of the lagoon assessment.

It's a requirement to take a look at it and figure out how to address the deficiency; correct?

A I would say that our experience is that if an agency such as Ecology labels something as deficient, that that's not the end of the conversation. It's -- something will follow as a result of that label.

The other concern expressed by the farmers is that, as soon as you label it deficient, even under a state standard, that you may affect their availability to get any financing necessary for other aspects of their operation.

So the label itself, a deficiency is problematic, even if it's compliant with NRCS standards.

Q But NRCS standards are mere guidelines; correct?

A They are guidelines, but I think, when there is a funding source to build to that -- and I believe other experts -- or other witnesses testified that a lot of these lagoons were built to NRCS standards since the adoption of the Dairy Nutrient Management Act.

Q Correct. But those standards are guidelines and not regulatory; correct?

A They are guidelines, but they're guidelines that have

come with funding, and they've also come with research and engineering to label them as good practices.

And so the change in where you measure the two feet then puts a different label on them that I think can be problematic for the operation and the financing of the farm.

Q So both you and Ms. Nicholson had called this a change.

Why do you call it a change?

A Well, because it wasn't that before.

Q That doesn't mean it's a change, does it? That just means it wasn't there before?

A Well, I guess I would submit to you that if you're adding in a phraseology that wasn't there before, that it is, by very definition, a change.

Q Well, the permit language might have changed, but where Ecology measures the two feet from, has that changed? Do you know?

A I believe it has, and I'll agree with you that the permit language changed.

Q So what is the basis for you to say that Ecology changed its longstanding position on where that measurement should be taken?

MS. NICHOLSON: Objection. That's misstating his testimony. It's also somewhat outside the scope of our direct.

JUDGE FRANCKS: No. I think he can answer.

A I would say the Department of Ecology changed the language of where it's measured, and prior to that, the standard was the NRCS guidelines.

So if there were not an intention or a need to change where you measure, then it begs the question of why Ecology changed the language.

And it also concerns us greatly that the language was changed without any opportunity to comment on the very significant implications of that change.

Q (By Ms. Barney) So -- but you don't have any information on what Ecology's -- how Ecology measured that two-foot vertical separation prior to the language being in the permit?

I mean, I understand that you have an understanding of where NRCS might be measuring that, but I'm asking if you have an understanding of where Ecology measured that from.

A I cannot go there on the reasoning that changing the language in any way means you didn't change the effect. I can't go there.

I think it is -- it is not logical, and I also believe that the -- this is significant language that was added in that was not available in the three drafts of

this permit that were put out for public comment.

MS. BARNEY: Thank you. That's all I have.

JUDGE FRANCKS: Okay. Mr. Tebbutt?

MR. TEBBUTT: Yes, I have a few questions.

CROSS-EXAMINATION

BY MR. TEBBUTT:

Q Who does WSDF employ, Mr. Wood? How many employees?

A Our employees are myself, Jay Gordon, Scott Dilley, and Darcel Nootenboom.

Q Isn't Fred Likkel an employee?

A Fred is a contractor.

Q Okay. How long has he been a contractor?

MS. NICHOLSON: Objection, Your Honor. Where is the relevance?

MR. TEBBUTT: Your Honor, this goes to Mr. Haggith's credibility and the weight the board should give his testimony because Mr. Haggith is a partner, as Mr. Haggith testified, with Mr. Likkel.

And so there's complicity here and a very cozy relationship between WSDF and the consultants to the dairy industry, and further testimony that will be elicited about the cozy testimony between WSDF and the Washington State Department of Agriculture.

MS. NICHOLSON: Your Honor, I don't understand the --

MR. TEBBUTT: For the record, this is the politics behind the scene that no one knows about and needs to be put on the record.

JUDGE FRANCKS: And it goes to which issue?

MR. TEBBUTT: It goes to all of the issues. It goes to the pervasiveness of the complicity between the Department of Agriculture, the department -- the Washington State Dairy Federation, and the influence that the dairy federation has on Ecology and this permit.

And if you'd allow Maia Bellon to testify about this, we would have had that information in the record as well.

MS. NICHOLSON: Same objection, Your Honor. There's no tie to the issues before this board.

MR. TEBBUTT: Every single issue is pervasive just like nitrate is to groundwater.

JUDGE FRANCKS: Okay. How much time is this going to take?

MR. TEBBUTT: Just a few minutes. Won't take long at all.

JUDGE FRANCKS: All right. I'm going to allow it for five minutes.

MR. TEBBUTT: All right.
A So can you repeat what the question is, please.
Q (By Mr. Tebbutt) How long has Fred Likkel worked for you?
MS. NICHOLSON: Objection. That misstates his testimony.
JUDGE FRANCKS: I'm going to sustain that.
Q (By Mr. Tebbutt) How long has Mr. Likkel been a contractor for the Washington State Dairy Federation?
A Fred was a contractor with the dairy federation when I came on staff in June of '13. How long before that, I couldn't tell you.
Q Jay Gordon could tell us; right?
MS. NICHOLSON: Objection, Your Honor. Relevance.
JUDGE FRANCKS: Well, I'm going to let him pursue this for five minutes, so --
A The question is, could Jay Gordon tell you?
Q (By Mr. Tebbutt) Yes.
A Is that your question?
MS. NICHOLSON: I'm going to object to lack of foundation here.
JUDGE FRANCKS: Well --
MR. TEBBUTT: Like a catch-22.

JUDGE FRANCKS: How about move on to a question he can answer?

MR. TEBBUTT: Well, all right.

Q (By Mr. Tebbutt) How long was Jay Gordon director before you were?

A I am recalling from conversations with Jay that he became the director in -- around 2000, maybe 1999, somewhere in that range.

Q Okay. So he'd be able to answer the questions about how long Mr. Likkel was employed; right?

MS. NICHOLSON: That was asked and answered. Objection.

MR. TEBBUTT: It's a simple question. Just yes or no. I mean, come on.

JUDGE FRANCKS: You can answer.

A Okay. I don't know if Jay could tell you because I don't know who preceded whom in their roles.

Q (By Mr. Tebbutt) You don't know who preceded whom.

Who are you talking about other than Jay?

A You were asking about Jay.

Q All right. Let's just go back to Jay would know whether Fred was an employee?

MS. NICHOLSON: Objection. Can he let him finish his answer?

A So I -- in answering your previous question, you were

asking, you asked me who besides Jay, and you had asked about Fred's longevity.

And then you asked me whether or not Jay could answer, and my answer to you was, I'm not sure who preceded whom, meaning, that I don't know if Fred was there in his contractor role before Jay was the executive director or if Jay was the executive director before Fred was contractor. I cannot answer that.

Q (By Mr. Tebbutt) Okay. Only Jay could answer that, okay.

So you were present when Mr. Gordon was deposed as Washington State Dairy Federation's 30(b)(6) witness in the Cow Palace case; correct?

MS. BARNEY: Objection, Your Honor, to relevance.

MS. NICHOLSON: Thank you.

MR. TEBBUTT: Do you want me to address this again?

JUDGE FRANCKS: Well, I want you to move forward.

MR. TEBBUTT: I'm trying. But I keep getting all these objections.

JUDGE FRANCKS: Okay. Well, you can answer the question.

A I'm not sure what 30(b)(6) means, but I was present when

you were deposing Jay in the different case.

Q (By Mr. Tebbutt) Right. And he was the designated person to testify on behalf of the Washington State Dairy Federation in the Cow Palace case; correct?

A Jay was the executive director at the time and was our spokesman and --

Q Right. And so you were there when Mr. Gordon testified that he got the -- an early version of the permit that's now here at issue in this courtroom from Jenny Prest at Washington Department of Ag before it was released publicly; right?

MS. NICHOLSON: Objection. Foundation and relevance.

JUDGE FRANCKS: Well, I've allowed him five minutes to talk about something that I'm not sure is relevant, but I'm giving you five minutes.

So I'm not going to sustain any more relevance objections.

So to the extent you can answer the question, please go ahead.

A Ask the question again, please.

MR. TEBBUTT: Will the court reporter please read it back.

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(Question on Page 1352, Lines 7 through 11, read by the reporter.)

A I don't believe that's what Jay's testimony said.

Q (By Mr. Tebbutt) What do you believe he said?

A For the entire seven hours?

Q No. Just -- he testified that Jenny Prest sent him a copy of the permit before it was released publicly; right?

A I don't believe that was his testimony.

Q He believed that -- he believed that he got it from her; right?

A I believe he said he received a document and did not know from whom it had come.

Q From an unmarked -- with an unmarked envelope; right?

A That would be why he didn't know from whom it had come.

Q But he believed it was from Jenny Prest; correct? That's what he testified to?

A I'm not sure that's what he said.

MR. TEBBUTT: Your Honor, this is the original transcript from Mr. Gordon's testimony in the Cow Palace case.

MS. NICHOLSON: Objection, Your Honor. Again, we're having a relevance issue here. This is from a different case entirely, from a person that is not

here, and it has no relevance to the issues before the board.

JUDGE FRANCKS: Mr. Tebbutt, your time is up.

MR. TEBBUTT: Well, Your Honor, you didn't let us put Jay Gordon in. You quashed their motion to allow Mr. Gordon to testify.

If we were allowed to put Mr. Gordon -- do you want me to do an offer of proof to get through this to speed this up?

JUDGE FRANCKS: Well --

MR. TEBBUTT: All right. Let's do it this way: As an offer of proof, I'm going to ask for an offer of proof --

JUDGE FRANCKS: Okay. Go ahead.

MR. TEBBUTT: -- to build this record because this is going to go up to the higher courts.

As an offer of proof, if Mr. Gordon were allowed to testify, he would testify that he got a permit before it was made public in 2011 or 2012 and that he talked to -- with Ms. Prest about it before this was all public and that this goes to the complicity between the Washington State Dairy Federation and Washington State Department of Agriculture in how they manipulated this permit.

And so that's just one of the offers of proof.

Mr. Gordon went on to testify about a number of things about the relationship with -- his relationship with the Department of Agriculture, with compliance issues, and how Mr. Gordon didn't understand what was going on.

There are a lot of issues that we're offering proof on with Mr. Gordon if he were allowed to testify. And I'm trying to elicit this through Mr. Wood, since you didn't allow Mr. Gordon to testify.

JUDGE FRANCKS: So let's proceed with the cross-examination of Mr. Wood.

Q (By Mr. Tebbutt) Mr. Gordon, you were around when the Cow Palace, Bosma, and DeRuyter litigation, known as the cluster cases, began to get under way.

That's when you came on board as director of WSDF; correct?

A They were under way, but I'm not Mr. Gordon.

Q Well, Mr. Wood. Right?

A Correct.

Q And so the dairy federation was involved in choosing the lawyers to defend the dairy -- the Cow Palace, Bosma, and DeRuyter cases; correct?

A That is not correct.

Q You met with -- Mr. Gordon met with dairies in the winter of 2013 in Richland, Washington, to determine who might represent Cow Palace, Bosma, DeRuyter, didn't they?

A We didn't choose or have any role in determining who would represent them.
Q No. But you introduced them to the lawyers who eventually became their attorney, didn't you?
When I say "you," I mean the dairy federation.
A So our role is not in choosing their counsel.
Q No. My question was: You introduced them to the counsel who eventually became their attorneys, correct, the firm of Givens Pursley in Idaho? It's a yes-or-no question.
A No.
Q You're saying you didn't, that the dairy federation didn't introduce Givens Pursley?
MS. NICHOLSON: Objection, Your Honor. He's badgering the witness. That's been asked and answered.
And can I -- is the time up so I can object on relevance grounds?
JUDGE FRANCKS: Yes. I'm going to -- I'm going to sustain that objection to relevance. I think we are now beyond the scope of anything that's related to this permit.
MR. TEBBUTT: Okay. Once again, as an offer of proof, if Mr. Wood or Mr. Gordon honestly testified, the offer of proof would be that the dairy federation was inextricably involved in introducing and

part of the early strategy for how to defend against the Cow Palace, DeRuyter, and Bosma litigation.

And this goes to the entire complicity and knowledge of the dairy federation in how the permit works and how they've defended against the science that is incontrovertible in this case.

And so it's a very important part of this case and the history of this case and needs to be on the record.

Q (By Mr. Tebbutt) You're familiar with the Bosma dairy owned by Henry Bosma over in the Yakima Valley?

A I know who they are.

Q You've met them before?

A I have.

Q Did you know that Bosma won Dairy Farmer of the Year from WSDF in the past?

A I don't know whether I knew that.

Q Okay. How about whether Cow Palace won Dairy Farmer of the Year from WSDF?

A I don't know whether I knew that.

Q How many times did you meet with Maia Bellon about the CAFO permit?

A I know we met with Bill Moore and Kelly Susewind. There may have been a couple of times where Maia was present.

Q How many times?

A There may have been a couple of times.

Q Did you specifically ask her not to include groundwater monitoring in the permit?
A I think that at all points in the process we were presenting information from experts we relied upon that we didn't think it was something that was a reasonable expense for the information that it would provide.
Q All right. Answer my question, please.
Did you ask her specifically not to include groundwater monitoring in the permit?
MS. NICHOLSON: Objection. That was answered.
MR. TEBBUTT: It was not.
JUDGE FRANCKS: He can answer the question.
A I think I was very clear in my answer, and I said, at all points in this process, we relied upon our expert information and presented that the groundwater monitoring didn't provide the information that was reasonable in light of the expense.
Q (By Mr. Tebbutt) Did you specifically ask Maia Bellon not to include groundwater monitoring in the permit? Yes or no?
MS. NICHOLSON: Same objection, Your Honor. That's been --
JUDGE FRANCKS: I think that was asked

and answered.

MR. TEBBUTT: It hasn't been answered. It was abated. He said "generally." I'm asking specifically.

A I didn't say "generally." I said "all."

Q (By Mr. Tebbutt) Okay. So that includes Maia Bellon?

JUDGE FRANCKS: You can answer that.

A Yes.

Q (By Mr. Tebbutt) And the same with surface water monitoring; you allowed her not to include that in the permit too. Correct?

MS. NICHOLSON: Objection. Argumentative.

JUDGE FRANCKS: I'm going to allow it.

Q (By Mr. Tebbutt) Yes or no?

A I believe that was consistent with what we had communicated at all points.

Q So that's yes; correct?

MS. NICHOLSON: Objection. Argumentative.

JUDGE FRANCKS: Okay. I'm going to sustain that objection.

MR. TEBBUTT: Just trying to get on the record that the witness is trying to get out of the question.

MS. NICHOLSON: Objection. That was inappropriate.

JUDGE FRANCKS: Mr. Tebbutt, just ask some questions.

MR. TEBBUTT: That's what I'm doing, and I'm not getting answers. I'm getting evasive answers. My job is to ask specific questions, and I'm not getting specific answers.

Q (By Mr. Tebbutt) You were asked some questions about the -- about the number of CAFOs in the state, and I believe you said 230 -- there are 230 CAFOs.

Is that dairy CAFOs?

A There are two 230 dairies that are 200 or above in their size.

Q Okay. How many above 700?

A I don't have that number. I was only looking at what reached the threshold of that 200 because that's where the cutoff is on the CAFOs.

Q Right. And you've heard testimony that only about ten of them are subject to the 2006 permit; correct?

MS. NICHOLSON: Objection. I don't believe I've heard that testimony.

MR. TEBBUTT: I'm asking him, not counsel back there.

JUDGE FRANCKS: He can answer the

question.
A I believe I heard a different number about the previous permit.
Q (By Mr. Tebbutt) What was the number you heard?
A I thought I had heard the number 24 that had applied for the past permit.
Q Okay. Even if it's 24, that's only about 10 percent of the meeting of large CAFOs in this state?
A That would be correct math.
Q Let's take a look at I-47, Page 8, Table 3, please. I-47.
You were asked questions about it on direct?
A Is this -- this says Exhibit 1 through 61. Is that the I?
Q Yes. That looks like yours.
A Thank you. Is this "Implementation of Training Nutrition Program for Farmers"?
Q Yes.
A Okay.
Q Please look at Page 8, Table 3. You were asked questions by Ms. Nicholson on direct about this just a short while ago.
A Okay.
Q And so these were the compliance rates?
A 94 to 96 percent.

Q Right. And do you realize that Cow Palace, Bosma, and DeRuyter would have been considered to have been in compliance with these time periods that are listed in Table 3?

MS. NICHOLSON: Objection. Lack of foundation.

JUDGE FRANCKS: I'm going to let him answer.

A I don't have the information on specific farms.

Q (By Mr. Tebbutt) All right. And, in fact, Judge Rice had made -- had made -- you read Judge Rice's opinion in the Cow Palace case; right?

A Yes, I did.

Q And Judge Rice found that the Department of Agriculture found that Cow Palace was actually in compliance with its DNMP while at the same time they were causing an imminent and substantial endangerment to public health; correct?

MS. NICHOLSON: Objection. Again, lack of foundation.

JUDGE FRANCKS: I'm going to let him answer.

A I'm not sure if that's exact language that was in his ruling.

Q (By Mr. Tebbutt) Do you take issue with what I just said then?

A No. What I said is, I'm not sure if that's the exact language that was in his ruling.
Q You don't disagree with the general proposition? You just disagree with the specific language that I used?
MS. NICHOLSON: Objection. That was asked and answered.
JUDGE FRANCKS: I'm going to allow him to answer that.
A What I'm uncertain of is whether that's the exact language from the ruling or if that's your characterization of the language from the ruling.
Q (By Mr. Tebbutt) Okay.
A I don't have it in front of me.
Q Please take a look at Exhibit A-77 in the environmental appellants' book. Should be behind you. It will be 77 through 80 we're going to talk about. You can put the other book away. I'm done with it.
A I'm sorry. 77?
Q Yes. Exhibit 77.
A Okay.
Q This is an email from you to Scott Dilley and Jay Gordon; correct?
A Yes, it is.
Q And then the bottom one is an email from Fred Likkel to you and David Haggith; correct?

A Yes, it is.
Q And then if you'll take a look at Exhibit 78, the very next exhibit, this is the report that is referenced in Exhibit 77. Isn't it the report from Fred Likkel to you?
MS. NICHOLSON: Your Honor, I'm going to object to the relevance of this email. It has no relevance to the issues before the board.
MR. TEBBUTT: That's funny because the second one down says "CAFO permit" on it.
JUDGE FRANCKS: Well, I'm going to allow it.
A So your question is?
Q (By Mr. Tebbutt) This is the report you asked Fred Likkel to send to you in November of 2016; correct?
A It appears to be.
Q And it has a whole listing of issues, including the CAFO permit, doesn't it?
A Yes, it does.
Q And negotiations with Lummi Nation that regards the concerns about the closure of the shellfish beds in Portage Bay; correct?
MS. NICHOLSON: And, again, Your Honor, now I'm going to object on relevance because that is not relevant before the issues before the board.
And I had another one, but I lost it.

JUDGE FRANCKS: I'm going to sustain the relevance because we're talking about the CAFO permit.

MR. TEBBUTT: That's correct. And what we're talking about is the influence of the industry on closing shellfish beds on contaminating the Sumas-Blaine Aquifer, on contaminating the Yakima Valley Aquifer. Couldn't be any more relevant to the issues.

MS. NICHOLSON: I remember my second objection. This goes way beyond the direct testimony as well.

JUDGE FRANCKS: Yes. Definitely does that as well.

So we're going to be limited to what happened on direct and what's relevant to the issues in this case.

MR. TEBBUTT: Well, again, as an offer of proof, Mr. Gordon had been allowed to testify, we would have talked about all of this and got this in to show Mr. Gordon and the Washington State Dairy Federation have been aware of the contamination and the closure of the shellfish beds due to the dairy industry for more than a decade, in fact, close to two decades, and the contamination of the Yakima Valley Aquifer for at least 15 years.

And this board has prevented us from getting that

testimony in, so it's an offer of proof. We make that for the record.

JUDGE FRANCKS: Okay.

THE WITNESS: So I'm not sure where we are with --

MR. TEBBUTT: I'm going to ask you another question.

I move to admit A-77 and A-78.

MS. NICHOLSON: Objection, Your Honor, again to relevance. The one document that he has -- the attachment has the words "CAFO permit" and to the extent that it has -- that he testified to that, we don't have a problem, but the emails and the rest of the information here has no relevance to the -- to the issues before the board.

JUDGE FRANCKS: You're doing A-77 and A-78 together?

MR. TEBBUTT: Yes.

MS. NICHOLSON: The testimony he tried to elicit regarding these particular exhibits had nothing to do with the CAFO permit.

MR. TEBBUTT: That's their opinion. Our opinion is quite different. It does indeed say "CAFO permit."

JUDGE FRANCKS: I'm going to admit the

one that says CAFO permit on it. Actually, I'll admit both of them since it's referring to it, so --

MR. TEBBUTT: One sets up the other.

JUDGE FRANCKS: A-77 and A-78 are admitted.

(Exhibit Nos. A-77 and A-78 admitted.)

Q (By Mr. Tebbutt) Okay. Let's take a look at A-79.

JUDGE FRANCKS: Mr. Tebbutt, can I just inquire how much longer you think you might be today?

MR. TEBBUTT: I can get done in about the next ten minutes, if the objections slow down.

JUDGE FRANCKS: That would be excellent. Carry on.

Q (By Mr. Tebbutt) You have A-79 in front of you?

A I do.

Q And this is a document created by the Washington State Dairy Federation?

A It is.

Q And did you assist in creating it?

A Yes.

Q And one of the things, if you'll look at the second bolded heading, what does the Ecology permit mean for you? Do you see that?

A Yes.
Q So this goes to what you were advising your members about whether to get the permit; correct?
MS. NICHOLSON: Objection, Your Honor. This goes far beyond direct.
JUDGE FRANCKS: I'm going to allow it.
A So we have never told anybody that they should or should not apply for the permit. What we have in this is a -- either direct quotes or a summary of what the permit says.
Q (By Mr. Tebbutt) Well, it's more than that, isn't it?
I mean, you say here in the second line down that the main question we were getting from producers is this, quote, Am I required to get one of these permits, end quote.
And your answers are just below that, aren't they?
A Yes. Let me read it.
Q I just did read it. So I'm not asking you to read it right now. I'm just asking you a question.
MS. NICHOLSON: Objection, Your Honor. He's badgering the witness.
Q (By Mr. Tebbutt) You can read it to yourself, but I don't want you to read it out loud right now. If you want to read it to refresh your recollection -- do you want to do that, Mr. Wood?

A So as I understand your question -- well, at this point I don't understand your question.
Q Well, I haven't really asked you one. You just said you wanted to read it.
Do you want to read it to yourself?
A You asked a question before I said I would read it, but I don't know what that question is now.
MR. TEBBUTT: Can I make the objection the witness is being argumentative?
A I'm trying to find out what your question is.
JUDGE FRANCKS: Mr. Wood, go ahead and read it.
Q (By Mr. Tebbutt) To yourself.
A I've read it. I don't -- I was wanting to read it in order to answer his question, but now I don't recall what his question is.
Q So what I'm asking is, those three bolded points, isn't that the information that you give to your members?
A Those three bolded points are a summation of the requirements of the permit and are provided because the -- the questions we're getting include, "Am I required to get one of the permits?"
Q And how do you respond to those members?
A By telling them what the permit says.
Q And those are the three bolded points here in A-79?

A Yes. But that is not advice on whether they should get the permit. It is simply telling them what the permit says.

Q So have you ever told any of the members not to apply for the permit because no one can prove that, for instance, lagoons actually discharge to groundwater?

A We have not told people whether they should apply or not apply. We have told them the provisions in the permit that they ought to look at before making their decision.

MR. TEBBUTT: All right. Move to admit A-79.

MS. NICHOLSON: Objection, Your Honor. Again, relevance. How is this relevant to the issues before the board?

JUDGE FRANCKS: I'm going to allow it. So A-79 is admitted.

(Exhibit No. A-79 admitted.)

Q (By Mr. Tebbutt) How often have you met with Gerald Barron (phonetic)?

MS. HOWARD: Objection, Your Honor. Relevance.

MR. TEBBUTT: Give me just a couple questions. I'll link it all up to relevance.

JUDGE FRANCKS: Well, what's the relevance now? Who's Gerald Barron?

Q (By Mr. Tebbutt) Who is Gerald Barron, Mr. Wood?

JUDGE FRANCKS: No, Mr. Tebbutt. I asked you.

MR. TEBBUTT: Oh, Mr. Barron is a strategist for the dairy federation, and Exhibit A-80 is his strategy for defending against the CAFO permit and other litigation in the state of Washington on behalf of the Washington State Dairy Federation.

MS. NICHOLSON: Objection, Your Honor. This is incorrect, and he's providing testimony that is improper.

JUDGE FRANCKS: And how is this relevant to the issues before the board today?

MR. TEBBUTT: Couldn't be more relevant, once again, because this is the strategy that was laid out and this is the strategy that they're implementing, and it's not based on science. If you'll allow me to ask some questions about it, I can -- this is allowable cross-examination of a witness.

JUDGE FRANCKS: I think we're beyond the scope of direct, so I'm not going to allow this line of --

MR. TEBBUTT: Your Honor, with all respect that's due, Mr. Wood was asked on direct specifically about permits and how it affects the

industry and how it affects people who -- you know, his members and their ability to survive.

This is directly relevant to the tactics that they've used to try to survive despite the fact that the science is all against them.

So this strategy is critical to what their game plan of how they've implemented this. This is the stuff they wouldn't give us in response to discovery, and we had to get it in a motion to compel.

JUDGE FRANCKS: But what issue is it relevant to?

MR. TEBBUTT: All of them. About leakage of lagoons. One says false assumption that leakage equates to pollution. That's one of the issues. It's based on false unproven assumption of pollution from lagoons not justified by current science. This is their language.

JUDGE FRANCKS: Mr. Tebbutt.

MR. TEBBUTT: It couldn't be more relevant, Your Honor.

JUDGE FRANCKS: And I find that it's not relevant, so please continue your cross-examination if you have anything left for Mr. Wood.

MR. TEBBUTT: All right. I move into evidence A-80.

MS. NICHOLSON: Objection, Your Honor.

JUDGE FRANCKS: And the objection is?

MS. NICHOLSON: The objection is, there's no relevance for any issue before this board.

JUDGE FRANCKS: Okay. And I'm going to sustain that, and we're not going to admit A-80.

MR. TEBBUTT: Okay. As an offer of proof, if Mr. Wood were allowed to testify about this, he would say this is the strategy that Gerald Barron, a crisis management consultant for -- a self-proclaimed crisis management consultant -- even has that language on A-80 -- used to defend this industry against legitimate scientific principles that are directly at the heart of the issue in this permit.

Your Honor, may I approach to hand you some documents?

JUDGE FRANCKS: Yes. But what are they?

MR. TEBBUTT: It's an email from February of 2018.

JUDGE FRANCKS: And why are we just seeing it now?

MR. TEBBUTT: Because it's cross-examination. It's impeachment.

MS. NICHOLSON: Objection, Your Honor.

How is this relevant to our direct testimony? How is this responsive to the direct testimony and how is it relevant to the issues before the board?

MR. TEBBUTT: Again, because Mr. Wood has testified that his poor industry is being put at risk and they're making representations to agencies that are false.

MS. NICHOLSON: Your Honor, this is testimony by the attorney. There are no facts in evidence to support his testimony.

MR. TEBBUTT: Trying to get the facts and the documents in.

I can tell you specifically the issue here. And we've had testimony about the DeRuyter facility and Mr. Erickson testified about how it has been a threat to the community because of the same facts that are present in the Cow Palace case.

And this letter from the dairy federation where the dairy federation is touting its members as wonderful people. If these are the wonderful compliant people, this goes to the compliance issues in Table 3 that we just talked about.

It goes to the dairy federation's representations of whether dairies are in compliance with their various permits, and this document from Jay Gordon of the dairy

federation and Mr. -- if allowed to testify, I'm sure Mr. Wood would verify that he was part of this to EPA, saying what a great dairy family the DeRuyter facility is.

JUDGE FRANCKS: This is beyond the scope of the issues in this case, so this is not relevant. And this is part of the thread that we are not pursuing.

So do you have other questions for Mr. Wood?

MR. TEBBUTT: If allowed as an offer of proof, this document would show that the dairy federation believes that the DeRuyters are, and I quote, "one of the hardest working families I have ever known. This family has continued to be dairy industry leaders in innovation despite the fact that they're contaminating their community."

MS. NICHOLSON: Objection. Your Honor, again, this is improper testimony from counsel.

JUDGE FRANCKS: Yes. Mr. Tebbutt, you're going to restrain from testifying and please --

MR. TEBBUTT: These are offers of proof, Your Honor. I'm not testifying. You know that that's not testimony.

What I say is not testimony. What the witness says is testimony. I understand that.

Q (By Mr. Tebbutt) Sir, you've read the EPA Yakima Valley study; correct?
A Are you talking about from 2012?
Q Yes.
A Yes.
Q And the dairy federation hired numerous people to try to poke holes in that document; correct?
MS. NICHOLSON: Objection. Your Honor. Argumentative again.
JUDGE FRANCKS: I'm going to sustain that.
Q (By Mr. Tebbutt) Sir, how many people have you met with in the Yakima Valley who drink contaminated water because of the cluster dairies?
MS. NICHOLSON: Objection, Your Honor. Argumentative. Outside the scope of direct and lack of relevance here.
JUDGE FRANCKS: I'm going to sustain that on outside of the scope of direct.
MR. TEBBUTT: Okay. Well, it's certainly not outside the scope of relevance, and this is appropriate impeachment.
So with that and being shut down on ability to put that in, I'm done.
JUDGE FRANCKS: Okay. Redirect?

MS. NICHOLSON: Yes. Just very briefly.

REDIRECT EXAMINATION

BY MS. NICHOLSON:

Q Very quickly, Mr. Wood, under R-16, which is your comments to Ecology, this was on Page 14.

A Okay. It's buried. Hold on.

Q Sorry.

A Which page?

Q Page 14 under R-16.

A Okay. Happens to be open to that page.

Q That's lovely. Do you recall what your concern was? You -- why you mentioned T-sum 200 in this particular paragraph?

A Yeah. I think, in the context we're talking about, spring green-up being a -- it says it's a term -- not a term we understand. The concern was that that was a very fuzzy phrase and that there are other options out there that are more specific, and T-sum 200 was an example of that, but it is certainly not the only example.

Q And then very briefly, with the prior permit, do you recall if you had any indication or belief that Ecology's definition of bottom of the lagoon was any different than NRCS's as reflected in the prior permit?

A You're talking about the 2006 permit?

Q I am.
A There was nothing to indicate there was any distinction that we're aware of.
Q And you were not informed otherwise?
A No. I had not heard that that had always been Ecology's position until this hearing.

MS. NICHOLSON: Okay. Thank you.

JUDGE FRANCKS: Board questions?

Thank you, Mr. Wood, you're excused.

So --

MS. HOWARD: We can do this in the morning, if you'd like, but we needed to address the addition of these read and review corrections to Mr. Reck's --

JUDGE FRANCKS: Okay. Let's do that in the morning. We'll do that first thing. Okay.

We are off the record. We'll reconvene tomorrow morning at 9:00.

(Proceedings adjourned at 4:44 p.m.)

C E R T I F I C A T E

I, ANDREA L. CLEVENGER, a Certified Court Reporter in and for the State of Washington, residing at Olympia, authorized to administer oaths and affirmations pursuant to RCW 5.28.010, do hereby certify;

That the foregoing proceedings were taken stenographically before me and thereafter reduced to a typed format under my direction; that the transcript is a full, true and complete transcript of said proceedings consisting of Pages 1117 through 1379;

That I am not a relative, employee, attorney or counsel of any party to this action, or relative or employee of any such attorney or counsel, and I am not financially interested in the said action or the outcome thereof;

That upon completion of signature, if required, the original transcript will be securely sealed and the same served upon the appropriate party.

IN WITNESS WHEREOF, I have hereunto set my hand this 27th day of June, 2018.

Andrea L. Clevenger

(Court Reporter, CCR No. 3041)