NOTICE OF INTENT TO FILE MAINE WASTE DISCHARGE LICENSE/MAINE POLLUTANT DISCHARGE ELIMINATION SYSTEM PERMIT APPLICATION
AND NOTICE OF PUBLIC INFORMATIONAL MEETING

IN RE NORDIC AQUAFARMS, INC.

Public Meeting At The Troy A. Howard Middle School

Reported by Robin J. Dostie, a Notary Public and court reporter in and for the State of Maine, on October 4, 2018, at the Troy A. Howard Middle School, 173 Lincolnville Avenue, Belfast, Maine, commencing at 6:00 p.m.

REPRESENTING NORDIC AQUAFARMS, INC.
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ERIK HEIM, NORDIC AQUAFARMS
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TRANSCRIPT OF PROCEEDINGS

MS. TOURANGEAU: Good evening. Welcome. My name is Joanna Tourangeau. I am an attorney from Drummond Woodsum who is here tonight on behalf of Nordic Aquafarms. I am an environmental permitting and compliance lawyer based out of Portland who has been working in this field for 15, 16, 17 years, something like that. I stopped counting. I started in 2000.

Also with me tonight is Erik Heim, the President of Nordic Aquafarms. He's worked on three similar projects. He is going to give an overview of the project, the treatment systems, the discharge quantities and quality. To his left is Elizabeth Ransom from Ransom Consulting. She has 30 years experience with environmental assessments and projects. She is going to give an overview of the discharge permit parameters and the Belfast Bay background conditions. To her left is Nate Dill, also from Ransom Consulting with 13 years experience and he is going to present modeling of conditions with the discharge in Belfast Bay.

We are here tonight to talk first about the overall public process for the project. I am going to give that overview and what we are doing tonight

is the MEPDES permit application public information meeting. This is one of several information meetings that will be held for the overall project. The overall project will also require a federal permit under the U.S. Army Corps of Engineers for the intake and outfall construction on the bottom of Belfast Bay and for impacts to protected resources like wetland. We will also be applying in the future for a Site Location of Development Act Permit and a Natural Resources Protection Act Permit from the DEP. Under the Natural Resources Protect Act, we will also be required to obtain a Significant Groundwater Wells permit. All of those three permits at the state level that are indicated up there will also require that we do additional meetings like the one we're having tonight. So those meetings will have additional meetings like this where we will be answering questions about all of the other aspects of the project. Once we get through and into that state level and federal level process, we will also be submitting applications at the city of Belfast level to comply with all of the local ordinances and there will be a public process associated with those applications as well, so this is the first of what will be many opportunities for public questions

regarding our proposed project.

Tonight, we are here to talk about the discharge from the project that is being proposed in our draft application. The public information meeting is required by DEP to be held in advance of us submitting our application while the application is still in draft form. We are required to submit to DEP a rough estimate of the number of people that are here tonight, so if you haven't signed in on the sign-in sheet that will very much help me in terms of counting how many folks were here tonight.

We are also having a court reporter here tonight, Robin Dostie, thank you, who is making a transcript of the entire hearing. This is in part because the main purpose of this meeting is for us to answer questions about the discharge to Belfast Bay and one of the things that I will need to do is create is a list of the questions about the discharge that were asked at tonight's meeting and ensure that we provide a narrative response to those questions and hopefully we will be able to answer all of the questions that are had here tonight as well and that will be in the transcript. To the extent there is a question that comes up that we cannot answer tonight, we will pull that question out of the transcript and

then provide a narrative response in our application. Please understand the application is still in draft, that's the point of this meeting, so there may be some changes from the information that we present tonight in response to the comments, the questions that we receive. We understand that the city of Belfast has also asked that there be an additional public meeting following our submission of our application to the DEP and we support that request.

Copies of our application will be submitted on or around October 19 will go to the DEP's office in Augusta. A copy will go to the city of Belfast. You can review those in either location. I have been advised by the DEP that it will also go on their website as will all comments and other written materials on the application under what's labeled on their website as the major projects section, so if you wish to review it on the internet it's available there as well.

Tonight, we are hoping to keep our presentation to approximately one hour. As I mentioned earlier, we have a court reporter here, we also have an ASL interpreter for those who require that assistance. This meeting is also being broadcast live on the regular channel that is used

for city meetings. There are 200 copies of the DEP fact sheet regarding all of the public process that is required for submission of the MEPDES permit, which is what this is, that are in the back and in the front, that's where the sign-in sheets are also located. Many of you picked that up. It's the two-page flier that some of you might have picked up and that gives you all of the contact information for DEP and how to participate in the application as it goes forward.

So what is this permit for? I'm going to go backwards actually. We are planning to take a bio break at 8 o'clock so that folks can have a minute. I am not going to base it on when we finish our presentation or where we are in the questions, but when it gets to be 8 o'clock I'm going to interrupt whoever is kind of up and we're going to take a quick 5 minute bio break and come back and we have the room until 9.

So what is this permit for? In 1972, the Clean Water Act made it illegal to discharge any pollutant from point source into navigable waters without a permit. The State of Maine regulates such discharges under their MEPDES program and that is the program that we have in draft application form that

we are here to discuss tonight. What that meant for Belfast is that discharges like those that were historically associated with the chicken farms are now illegal, so there will not be those kinds of contaminants going directly into Belfast Bay.

I am going to turn it over at this point to Mr. Heim to start off with a general discussion of the project.

MR. HEIM: Good evening. I am going to just give a brief overview of the project.

AUDIENCE MEMBER: We can't really hear you.

MR. HEIM: You can't hear us?

AUDIENCE MEMBER: No.

MR. HEIM: Okay. I understand we have to have it almost in our mouth for it to work properly.

AUDIENCE MEMBER: And if you could step back so we can have eyesight of interpreter.

MR. HEIM: So -- yeah, can you all see the screen?

AUDIENCE MEMBER: Maybe go behind the podium.

MR. HEIM: I'll go behind here. Okay. I'll hide behind here so everybody can see. I realize that not everybody has maybe been to our meetings, so I'm going to give just a brief overview of what we

are talking about.

AUDIENCE MEMBER: Can't hear you.

MR. HEIM: Can't hear you. Okay. I'm going to try and speak as loud as I can. So our production is dependent on clean water and that means we have an interest in keeping it clean and that's also part of the purpose of what we're going to be talking about today and how we are going to achieve that. And for those of you who haven't been to these meetings just a short explanation of what we're talking about. This is an indoor operation where we have an operation that goes from salmon eggs to what we call smolt, that would be small salmon, and then take them through the growth stage to harvest size. And this facility would basically produce filets and so-called head-on gutted fish. Only fresh product only going by road transport to Northeast region. Today most of the salmon is flown in by airplane to the U.S. from abroad.

The benefit of having all of this in one place is traceability. You can trace every step of the process, you know exactly where it comes from and that is something that consumers increasingly are concerned with. All of this is based on so-called recirculation systems. This means that we

recirculate water in the system and clean it continuously and one of the benefits of that is that you reduce water usage. Historically, they were using flow through systems for land-based systems. It required a lot more water than we do today. And the alternative is sea pen production, which is not that common in the U.S. anymore. I believe the only place left is northern Maine. Beyond that, a number of other countries do still work with sea pen production.

Okay. I am just going to explain how we ended up here. We did a scientific search of the entire coastline from Washington D.C. up to Canada. We had a long list of criteria that are important in terms of deciding a good site. In every case there is trade-off in terms of sites. One of the reasons we ended up in this water, the region, is clean water, cold water. It's excellent conditions for salmon. And also the other issues that we looked at is what's a nice community for employees to move to and work in, is there power access, what's the proximity to larger consumer markets so we can deliver fresh product, high quality fresh product. All of these considerations came together. We probably walked 20 sites in Maine and this particular

area and this site was the one where all these things came together in a good way. So that means it's not easy to find good sites for these kind of projects.

In terms of why should this be interesting for Maine, and more specifically Belfast, it's a matter of creating jobs. It's a lot of business for vendors, companies locally and in Maine, and that also means indirect job creation in other companies. We have a number of academic institutions in Maine who work with aquaculture and obviously there is synergies in terms of that whole academic branch in Maine, also given the political interest in growing the aquaculture sector for Maine in the future. So there is a number of things that come together and of course there is also the value creation that also means tax revenue, which is significant. I believe this project will by far be the largest taxpayer in Belfast as well. So we look at the holistic picture of this in terms of this and look at it up against the disadvantages and what we'd be working to do is minimize disadvantages and this is the first part of the impacts that come along with that.

So I think one important thing to just go through is we are not a sea pen operation. We are a company that sort of went against the incumbent

industry and we wanted to do things differently and typically a lot of the things that have been associated with salmon production are related to sea pen. So a couple of the things that are important is that when you're talking about discharge today we're going to talk about the advance technology that's already been used in industrial wastewater treatment across the globe, but we are one of the first companies really investing in this because we believe it is the future. And the other thing is a lot of the things that you filter out from a discharge is high in nutrients and that's a resource. And if you look at the industry today, the byproducts value added processing is a part of the future because it creates value in jobs also and that's exactly what we're doing in this project.

Everything we take in or release for water is also treated for bacteria and pathogens. One of the most important things for us is to prevent stuff in the bay coming into our facility. That's the source of disease for us, so we treat that vigorously on the way in and we do the same on the way out. So that's also something that's different from sea pens where you're basically open to free movement of these things. And we also have extensive barriers to fish

escape, which has been a traditional challenge to some extent in sea pen operations and so that's also an issue that's addressed. Typically, sea pens have been treating for sea lice and parasites. We filter them out before they can reach our fish, so we don't use those kind of medications. That's another benefit. And obviously we develop this on private property while other operations are in open water public space and domain. Finally, there is the issue of what you give your fish. There is a great variation in practices in this area. Our focus is a high quality product and that means what you feed your fish will determine the quality of your product you get out the other end. We're going to get back to that also.

So a little bit about the timeline. We've been -- we started this process last winter. Currently, we are working our way through permitting, that also requires engineering, so that's currently ongoing. And this project is then planning on working through all of this towards next summer where engineering is basically going to put us in a place where it's possible to start construction, that's the rough timeline.

And that, I believe, Elizabeth, are you

going to do the permits thing?
MS. RANSOM: Sure.
MR. HEIM: I will get back to the specific water treatment and discharge figures after Elizabeth is done her part.
MS. RANSOM: Good evening. Am I able to be heard? Is this close enough?
MS. TOURANGEAU: Speak up too.
MS. RANSOM: Okay. And I apologize, folks, for the thumping background. There is nothing we've been able to do about that. I do apologize.
So what does this permit regulate? As Joanna mentioned earlier, the reason we have a MEPDES permit process is due to the Clean Water Act. In the early '70s there was a list of things in particular that we knew we wanted to keep out of our waters whether it was rivers or oceans and there were various types of pollutants that were described. When we think of pollutants there are two types of pollutants that we can list. One are things that are considered toxic and there is an actual toxic substances list that was created in 1977.
AUDIENCE MEMBER: It's very hard to hear you, Elizabeth.
MS. RANSOM: I'm sorry, I'm not quire

sure --
MS. TOURANGEAU: Talk right into the mic.
MS. RANSOM: There we go. So there are two types of pollutants that are typically regulated under a discharge permit. One of those would be the types of things that we think of as toxic substances. Those are things like pesticides, heavy metals, things that we can all kind of relate to as being clearly not good for us. But it also regulates non-conventional pollutants such as nutrients and that is what this facility is producing. It's compounds like oxygen, nitrogen, and phosphorous, things that are necessary for life, but if we have too much of them they're harmful too. How many of us have been to a doctor and had somebody say you need to reduce your cholesterol and stop eating so much of X? We obviously need carbohydrates and protein to survive, but obviously too much of a great thing isn't great for us, so that's what we're here to talk about tonight. Nordic Aquafarms waste stream will discharge low levels of residual nutrients, not toxic, but that nutrients still is something that is regulated under the MEPDES process.
So what are those nutrients? I'm going to talk about what some of those key things are. So

some of the key nutrients that are typically regulated and looked at under the MEPDES permit include total suspended solids, biological oxygen demand, nitrogen, and phosphorous. So what are those? So TSS is the amount -- is an actual measurement of the amount of solids in water that can be trapped by a .2 micron filter, so that's a really small filter. And the good thing about this is it allows us to actually take a measurement from a laboratory that is standardized and tell you, jee, what kind of an impact are we having? So is my treatment system working the way it's supposed to and taking those solids out before we discharge something to sea. Because think about it, we all know what TSS or too much TSS looks like. How many go swimming in the bay after a storm and it kicks up a lot of stuff and we can see floaty things when we're out there in the bay, that's TSS. That's things like phytoplankton, silt, decaying plants, animal waste, sewage, there is a lot of things that can go into TSS and that's one of the parameters that Nordic is going to need to monitor when they have a discharge. If TSS is too high, over time the solids that come out of the TSS are obviously not good for marine life and can cover the benthic communities at the bottom of

the bay, so we want to keep TSS low.
So then we also want to look at something like biological oxygen demand. This is a general parameter that is commonly put onto a discharge permit. I would gather that it's something that your local wastewater -- municipal wastewater treatment plant also monitors. It's a measurement of the amount of dissolved oxygen needed by aerobic organisms to break down the organic matter in water over time. So when BOD levels are high the oxygen levels decrease because the oxygen that's available in the water is being consumed. So when DO goes down some of our most beloved sea creatures are not really happy. So those levels of DO, for example, are things that lobsters don't like. So we want to keep BOD low and in turn we want to keep DO in the right range.
So another vital thing that we'll be measuring is nitrogen. Nitrogen is the most abundant element in the earth's atmosphere. We all need nitrogen for production of amino acids and the building blocks for protein. Plants also need it for photosynthesis. And in sea water we have a lot of different sources of nitrogen. There is agricultural runoff, there is point discharges such as wastewater,

there is general runoff from lawns and other development and then there is atmospheric deposition. In fact, the majority of the nitrogen that we have in sea water is naturally occurring from atmospheric deposition. But if we have too much nitrogen it can lead to increased plankton and combined with too much phosphorous it can lead to algal blooms. So this is a parameter that obviously we want to make sure we monitor going forward and that the discharge is monitored for going forward so we know there is not too much nitrogen being released to the bay.

And another parameter that you'll commonly hear when people are talking about in particular algal blooms is phosphorous. It's also another common earth element and it's found in sea water and it's essential for plant life, but, again, too much of the phosphorous can also add to the potential for the algal blooms and the degradation of the water quality, so that's something we're going to be looking to keep monitoring from the facility. Common sources of phosphorous include also things like agricultural runoff and lawn fertilizer and animal waste.

So, again, we are primarily interested in having on the permit the things that would be coming

from the facility as nutrients. We're trying as a part of the process that Erik will be talking about to do a good job of treating for those and also by removing as much of the solids as possible we're going to keep some of those things down even before it gets into the treatment plant in some ways because a lot of those solids are things that can be reused and recycled.

And Erik is now going to come up and tell you a little bit -- oh, actually, before he does, I've got one more very important slide. Sorry.

So what are the levels out there now? That's a really important starting place, right. We have a bay that I think most of the people in this room really love and want to keep looking good. And so one of the things we need to do is we need to understand what are background conditions, how healthy is the bay now and that way we know going forward if we're having an impact. There are places in the bay where there are regular datapoints that have been collected over the years. There are certain stations where data goes back, you know, you can look back to certain academic studies that have gone back to the 1970s. There are other places where the EPA has collected some data in the 2000s, but

none of those were exactly in the point of where this project is planning to discharge, so we've started to establish a dataset for this project. We've gone out over the past few months and started to collect some data.

So just real briefly, a summary is the TSS we've found to be in the range of 6.9 to 11 milligrams per liter. And, again, for those who aren't used to thinking in those terms that's parts per million. BOD is currently low. We've been at or near the laboratory detection limit of 2 milligrams per liter. Phosphorous has ranged from .012 to .024 milligrams per liter. And nitrogen has ranged from .17 to .08 milligrams per liter out in the area of the discharge. And then we've taken some additional samples of nitrogen and phosphorous up close to the Little River Dam because we frequently see some of these parameters are higher in fresh water than they are in the ocean itself and we did, in fact, find that the nitrogen kind of right off from the Little River is a little higher. It was up to a .78 milligrams per liter. And I don't expect everybody to memorize those numbers, but I think you're going to find those ranges come in handy later as we start talking about what's coming from the discharge

itself.

And with that, I think Erik is going to come back and tell you a little bit more about the treatment process.

MR. HEIM: Thank you. So we're going to talk through a little bit what we are doing for treatment of the discharge and the technologies behind that. And an interesting sort of history both in the U.S. and Europe when you look at how companies generally in various industries have moved through these processes. If you look at most permits today in Maine none of them contain requirements for phosphorous and nitrogen, for example. But this is a change that's coming politically in the U.S. and we've seen in the U.S. and we've seen the same in Europe as well and it's important because all of these things do influence ecosystems.

I'm going to take you a little bit through the process in rough steps. This is the wastewater treatment process and typically you would have industrial companies who are discharging and applying various levels of wastewater treatment. You can have municipal infrastructure doing the same and so are we. The basic component coming into this is basically feed and feces from fish, and I'm going to

talk briefly about feed afterwards, but that's really the basis for the discharge and this is what contains the various nutrients that we're talking about.

So this is a multi-step process and the important thing is to address the issues that Elizabeth was just talking about. The first step is nitrogen. In this case, we are one of the few companies in the world who implement denitrification as it's called. It's a filter system populated by bacteria that breakdown by nitrogen in very simple terms. So in this case, this is a part actually of the production environment so it's continuously reducing nitrogen in the fish tanks before discharge. This facility reduces 85 percent of nitrogen produced in the fish tanks. We are not familiar with anyone doing this. That's the pretreated water and in those fish tanks there is also a treatment process removing CO2 and other types of substances, but the pretreated water goes to the wastewater plant. So typically you will see in lots of wastewater treatment plants potentially also drinking water in some cases are treating for P reduction and this is also the case here. There is a process in the wastewater plant that reduces phosphorous by 99 percent before the water is discharged.

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Then there is something that is quite unique to this industry, which is membrane microfiltration. Now, this goes down to a mesh size of 0.4 micro. That means it also takes out bacteria. That gives an idea how finely mesh this is. So this is part of what takes out almost all particles and bacterial elements that might be there in the first place.

And then there is a final step which is called UV light dosing. UV neutralizes pathogens and there is a very strong dose that basically is treating every drop of water going through the system. It's the same with the intake water as well. So the combination of the system is really what addresses some of the issues that Elizabeth was talking about and what I'm going to do then is to take it a little bit further so you can see what this means. And an additional question is in a facility like this you are dealing with live creatures, so everything in this facility has backup systems. Should the power go out, they will kick in immediately and that's also the case for this.

Just to show you a little bit more about microfiltration. Like I was saying, 0.4 micro. It's very, very finely meshed. And then the final step is the 300 micro dose of UV light going through this

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water and that will pretty much take out every bug you can think about in this case, but the primary strategy we have is to never let bugs in the first place from the bay in the system. That's why we also treat the intake water and that's also why the risk of discharging anything of bacterial nature is very low in this process.

Just a final step in terms of the treatment process. So there are solids coming out of various parts of this treatment process. All these solids they go through a special dewatering process and what you end up with is a sludge very high and rich in nutrients. And this sludge is in Maine's case going to biogas production. Other cases we see, for example, Norway, it's used for fertilizer, other types of projects, but in Maine we are sending it to biogas production. And the -- yeah, and that basically means none of this is going into the ocean. It's being recycled.

Just about -- a few words about the feed profile. So any time you calculate your discharge you start with parameters related to the feed. How much feed are you using, what the are nutrient profiles that you're looking at for your feed and that's the whole basis for what we do also. And in

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the industry today there is a wide variety of feed ingredients you can choose from and there is also new ones coming into the industry on a continuous basis. So this basically means that any producer can almost tailor their feed in any way they want. So in our calculations, we take in the feed types and ranges that we are interested in looking at --

AUDIENCE MEMBER: The slide is gone.

MR. HEIM: Oh, what happened?

AUDIENCE MEMBER: I hope this doesn't happen with the fish farm.

AUDIENCE MEMBER: Maybe dim the lights so we can see the slides better.

MR. HEIM: Can we reduce the lights?

MS. RANSOM: I'm sure we can.

MR. HEIM: We can try to see if we can make that happen. So when we start sourcing our feed, so we pretty much know the profile of the nutrients in the feeds that we're going to be looking at, but we have a lot of choices in terms of ingredients. So the U.S. in terms of the feed producers we are talking to, all of them are highly focused on being USDA, FDA and ISO compliant in terms of anything they use in their feeds. So everything is following federal law in the U.S. and basically as the same

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with the food products we eat ourselves. It's highly regulated in the U.S. as it is Europe. So this is just to let you know that this is how the process works. You start with the amount of feed, the feed profile and then you get to the sort of composition of feed that you're looking for.

Just a couple of words also, medications is a chemical that's also included in the application. Now, the way this works in the U.S. you have to list every conceivable substance you will ever use and that's why we also then list every conceivable and, for example, some substances we will change over time for various reasons so we have to list alternatives also. All of this will be included in the application. This is just some internal comments related to that, for example, antibiotics are not used in the industry anymore, at least not in Europe, but there could be a contingency case where you would need to use if for a short period of time for fish welfare purposes and so these are the kind of things we will list in the application. Any use of these will be handled through a U.S. veterinary according to U.S. law just so we are clear on that.

Okay. I'm going to get right into the actual discharge and give you the factual figures.

These figures are based on the total future production of 33,000 metric tons. When we start production, Phase 1, the figures will be half of this. And TSS, as Elizabeth described, this facility reduces 99 percent of the gross discharge through the wastewater treatment. That leaves 185 kilos per day or also in the concentration as commonly used as 6.3 milligrams per liter. The background value in the bay is 6.9 to 11. That means the water we are discharging has a lower level of TSS than the bay.

The next one is BOD as this one explains. This facility discharges 162 kilos per day fully developed. That's a 99 percent removal of BOD or also 5.5 milligrams per liter. The background value in the bay is approximately 2. That means our discharge at the pipe is slightly higher and as the modeling will show in the next part of the presentation that is diluted quickly to background values in the bay.

Phosphorous. 99 percent removal. 5.8 kilos per day or 0.2 milligrams per liter. Background values are 0.12 to 0.24, slightly higher than the bay background values. Again, the modeling will demonstrate how quickly this is diluted a short distance from the pipe end.

Nitrogen. 85 percent removal. It's the most difficult one to remove as all wastewater plants know. Our benefit here is we can remove it continuously in the production, otherwise we would require a pretty large holding tank structure to reduce this. 673 kilos per day, concentration of 23 milligrams per liter. Background measured is .17 to .48. Again, most of the modeling we have done that you will see is based upon nitrogen because it is a bit higher than the background and we want to show what that means. Important thing in nitrogen is ammonia. It's the most harmful element in nitrogen. Total discharge per day is 0.7 kilos per day or 003 milligrams per liter. The background levels in the bay are higher than this concentration.

So how much nitrogen is this really? We have looked at studies done on the bay before that have mapped out the various sources. I believe this was touched upon earlier by Elizabeth. Based upon that study, this total discharge makes about 0.75 percent of the nitrogen coming into this bay. So that gives you an idea of the amount in relation to the natural sources or other input sources that are coming into the bay today.

Just before we look at more of the modeling

of this, one of the important things that we do in Europe and we will be doing here it's also dependent on DEP requirements and what they're asking is monitoring of this, so we have self-imposed monitoring programs and there will be DEP requirements related to those. Most of these factors are measured by sensors and also manual lab tests on a regular basis. There are kept logs for this. They can be audited at any time by the authorities. And obviously we have a self-interest in monitoring these and making sure that we comply with the law. As in Europe, there is a penalty if you don't stick to the permits that you receive.

So that leaves us really with the next step, which is the modeling that has been done for the bay. This has been done by Ransom. It's also being quality assured independently by the Ramboll Environmental, a large environmental company in the U.S. Their report on that will also be submitted with the application.

So I'm going to turn over to you.

MR. DILL: Thanks, Erik. Can you all hear me all right?

AUDIENCE MEMBER: Fine.

MR. DILL: So my job here, I guess, to give

you kind of a little bit of introduction has been to come up with an assessment or prediction of what's going to happen with this discharge when it goes out into the bay. And I think one thing that's important to understand going into this is that we've just -- we've just learned from what Erik and Elizabeth talked about that the water that is actually being discharged is really very, very clean. And so when we talk about what happens after that, it's -- we're looking at how that water is getting mixed with the water that's in the bay and how that is even further getting diluted and so any components that are in that water the concentration of them is going to be reduced significantly.

So to kind of start with the end result here, I think we're looking at this figure here and what this is showing you -- and I think I have a laser here I can point to. This location right here is where the outfall -- there will be a pipe that extends off-shore here underneath the water and near the bottom it will be discharging the effluent from that, the wastewater from that pipe right around in this area. It's about a thousand meters off-shore here. And one of the things that we've looked at is what are the populations that are nearby that might

be sensitive to this. And so we now from -- we know from the state they have records that document in the past at least there had been some eel grass here and eel grass is one of the things that's known to be sensitive to nitrogen concentrations. So one of the things we looked at is, you know, what's the impact going to possibly be there. And so what this figure is showing you here, this blue -- this little blue area here, you know, some of the lighter blue to a darker blue is an estimate of the nitrogen concentration. I apologize, it's kind of hard to read what this shows here, but on the dark blue end of it on the edge of it, which I'm kind of trying to circle with the laser here, that's a value of about .3 milligrams per liter of nitrogen, which is -- has been shown in other estuaries, not necessarily in Belfast Bay, but, you know, we don't really have that type of information for this specific location, that if the nitrogen concentration stays below that level it doesn't really have any impact. And so we can see here it's not even really getting close to these areas. So that's kind of the end of all of the work that I did that has shown, you know, that has shown this and so I'm going to try to explain how we got there so you can understand a little bit.

My task has been to try to predict what's going to happen in this very, very complicated natural system. There is all sorts of factors that complicate this. There is just simply the understanding of the physics of the flow of the water, the, you know, factors like the weather that we can't predict and sort of just the chaotic nature of what happens in natural systems. And so the -- different than a lot of sort of other -- you might think of more traditional engineering where, you know, you might be able to calculate very precisely the flexion in a steel beam if you know what the load is on it. Trying to predict what's going to happen in a system like this is much more complicated. We take a similar approach. We look at what physics says and physics, you know, we have laws of physics like the Newton's second law, conservation of momentum, conservation of mass. We can use those to write down mathematical equations and then we can simplify those equations so that we can solve them and we use computer programs to solve them. And so what we have done here is a computer model that basically solves the equations that describe the physics of water flowing in the bay. And so, you know, it's what -- how is that water driven by the

tides, by the gravity, from the moon and the sun and how is that water forced by water that is flowing down the river and coming into the bay and then how is that water constrained by the depth, you know, and the geometry of the shoreline of the bay. And so we make, you know, sort of the best attempt that we can to be able to understand to solve those equations to be able to predict what those currents are going to be.

And what this is -- what this is showing here is this is a computer model called ADCIRC that we ran and I think if I click, will it...

MS. RANSOM: I can do that.

MR. DILL: Oh, there it goes. It goes. So what this is showing here is this is the results from the model simulation that -- this is, I guess, for perspective here, Belfast is up here, this is Islesboro down here, I think this is North Haven, so this is kind of the upper Penobscot Bay. And I might have to click again. Oops. If I can make it...

MS. RANSOM: If it's easier, I could do it.

MR. DILL: There it goes again. What this is showing, you can see there is little pink arrows here and the color is indicating how fast the current is flowing and the little pink arrows are indicating

what direction it's going. And so what this is showing is this is about a two day period where you can see how -- it gives you an idea of how the currents circulate around in the bay and you can see it's pretty complicated. So once we've calculated that we kind of have an estimate of how that water moves around and what we can do is we can use the computer again to go on to this next one here to kind of put little -- put little tracers that will move around with that current. And so what animation showing you is just what would happen if you were to kind of scatter, you know, a bunch of, you know, ping pong balls around the bay and watch them go during that same time period. And you can see what happens is -- let me see if I can get it to go again. If you kind of keep your eye on -- maybe pick sort of an orange one or red one from here and just kind of follow it you will see they kind of move back and forth as the tide goes and then they also kind of tend to drift. And you can see how they kind of get stirred up and you can imagine how -- you can kind of see now how they're getting mixed up and so what we're trying to do is predict how that mixing happens and we use these little, you know, numerical drifters to do that. And you can actually -- you can actually

see a lot about, you know, what's going on there by looking at this picture. You can, you know, you can get an idea of, you know, if you were to fall overboard and off of your boat and just drift with the tide for a couple of days where you might end up.

All right. So that was showing -- if I could -- I'll go back and I'm going to play this one more time. This is kind of showing what happens if you put a whole bunch of ping pong balls all over the place and just let them drift around and how they mix together. But in order to -- in order to predict, you know, estimate what's going to happen with the discharge that's being continuously released, instead of scattering the ping pongs all over in the beginning and see where they go, we kind of take ping pong balls and we just kind of release them one at a time after another continuously. And in this simulation -- in this case, we ran the simulation for a month doing that and you can see that after about two weeks in that simulation the, you know, they move with the tide, they move with the current and they drift and they move back and forth and you kind of -- the ping pong balls also kind of spread out naturally because of the turbulence of the water and other effects.

And once -- and what we've seen in this case after about two weeks you kind of reach this sort of equilibrium where the rate that the ping pong balls are being distributed into the bay is -- it matches the rate that they're sort of disbursing and diffusing and so you kind of reach this sort of quasi steady state. So that's what we're looking for and once we've done that -- this is another -- let's see. Oops. We can use those ping pong balls to represent something like -- something that's in the discharge water. And, you know, for example, the nitrogen -- the amount of nitrogen. And then we can go back and after we've looked at where they've all spread out, we can calculate what that nitrogen concentration is and we can estimate what it's going to be.

And let's see if I can get this to -- oh, you know what, it's really hard to see here because the nitrogen concentration, this is about .5 milligrams per liter and this is that value of about .3 that the eel grass might be sensitive to and if you look really hard here --

MS. RANSOM: Do you want me to play it from your animation?

MR. DILL: Yeah. If you could play the one on the USB stick, I think it might be a little better

quality.

MS. RANSOM: Yeah, it might work a little bit easier for us.

MR. DILL: That's my heart thumping that you can all hear.

MS. RANSOM: There we go.

MR. DILL: It looks like it's fading away. So what we're looking at here is this is about 25 days of what the tide does and this is based on a -- this is actually based on tidal observations from the Fort Point Tide Station for a time period in 1999. We simulated that time period because there was data collected at the tide station there and we were able to compare that to the hydrodynamic model and demonstrate that it actually reproduces the same tide level. If you -- I think one of these will make it play in a loop. I don't know...

MS. TOURANGEAU: I'm just going to hang out here and make it...

MR. HEIM: That one next to it.

MR. DILL: Turn repeat on. Yup. So this little red dot moving up and down here is just showing you the time and what you can see here is this is that nitrogen concentration. And so we're looking at now the nitrogen concentration is varying

over time. And one thing that we've noticed from this that we learned from this is that when the tide is -- tide range is larger, so when we have a spring tide the currents are stronger and that -- that tends to spread out the discharge more and so it keeps that -- the concentration to that -- below that level that -- below that .3 level that we can't even really see it on here. And so you'll watch as it comes back from the beginning here, we really don't see much -- we really don't see much going on here when the tide is big. It's just kind of getting washed out, you know, you can imagine it's kind of getting smeared out. And then when you get up here when the tide range gets a little bit smaller you start to see that -- you start to see the concentration show up a little bit here. And then during that neap tide you start to see the concentration because the currents aren't moving much, but then when it gets back to a spring tide again it spreads out more.

And I'm going to just jump back again and so -- oh, yeah, we need to go back to the PowerPoint. Sorry. So the information that we have on how the nitrogen affects things like the eel grass bed is based on measurements that are taken over time at multiple sites, but, you know, different samplings

over a period of time and some statistics that are done based on those measurements and other observations about how, you know, how wildlife is, you know, living within the water. And so those statistics use a median value, so if you were to keep taking samples over time, if you took a sample every day for the next hundred days or if you took a sample every hour for the next few days and you measured all those values of nitrogen because it changes all of the time, it's constantly varying from all of the other different types of sources, and were to find the value that was the median value, so an average value, we calculated that average -- that median value and that's what is shown here. So if you look at those -- the results from that animation and you were to average that over time this is the result that you'd get. And that average value is the value that we have -- that we actually have that we can correlate with other sorts of things that would lead to impacts. And so that's what this is showing here. That's the average over that entire simulation.

And I'm going to just jump back ahead here. So what I just talked about was what happens in what we call a far field, so when the discharge is released into the bay and now it's being driven by,

you know, what's happening to it is largely driven by the currents. It's the -- the actual outfall itself, the structure that the water is coming out of doesn't really have any affect on the mixing. It's really what's going on naturally. It's the tidal currents and other factors, it's the wind, it's the waves that are controlling that. So but what happens right near the -- right near the outfall, this is where the concentration is of that wastewater are highest and so we used it on another model and this model is called CORMIX and this is a model that's used -- sort of a standard model that's used for wastewater discharges all over the country. It's developed and approved by the EPA. And what this does is this model looks at the physics of what happens when that water comes out of the -- out of the end of the pipe and it's got a lot of momentum and you can kind of envision, you know, the water coming out and it's pushing against the existing water and it's creating a whole lot of turbulence and it's mixing it all together and so that's what this model shows. What we do -- what this model does is it calculates a dilution and a dilution is a specific number that is the ratio of -- sort of the ratio of the amount of one substance or one volume of water mixed in with

another volume of water. So you can imagine if you took like a cup of orange juice, for example, and put it into an empty gallon jug and -- who knows how many cups there are in a gallon? I think it's 16.

AUDIENCE MEMBER: 16.

MR. DILL: 16. So then if you filled that jug the rest of the way up with water you'd have a dilution of 16. So what we're looking at here is that dilution number. Once you understand what that dilution number is, if you know the concentration of something, which we're already in this case if we're looking at nitrogen or phosphorous or TSS or BOD those concentrations are already very, very small. So that orange juice has already been diluted 100 times or more and then you're diluting it even more. And so this -- that dilution number really tells you how much that, you know, that substance is being reduced in concentration. So this -- what this figure is showing is that just in that initial area right outside the outfall -- and this is actually what -- this is a -- if you can imagine that you were looking down -- looking down from above, this is sort of a plan view, a bird's eye view of what the discharge looks like, and you can imagine the currents flowing in this direction and so, you know,

the tidal current changes, so we do this with different currents flowing in different directions, but this is just one example. So the current is flowing this way and the discharge is being, you know, ejected perpendicular to the current and you can see that the momentum from the discharge is pushing it out here and it's mixing with the ambient water. And then finally, the current kind of takes over and moves it along here. And once you get out in this area, which is only -- this is only -- this is like less than 10 meters away from the outfall pipe, that dilution -- dilution is already more than 20 and this is actually what's showing is this the concentration. So the concentrations here are only 5 percent of what they are down here. And that's just within the first 10 meters of this. That's the plan view.

We can also look at it as if you were standing on the bottom looking -- sitting on the bottom of the bay looking out at the pipe and so this is upward, you know, the surface of the water is up here. And, again, the current is going in this direction. The discharge in this case it's -- the water is a little bit fresher than sea water and so fresh water tends to float so it wants to rise and so

you can see it's rising up because of the buoyancy and the current is also pushing it down. And, again, once we get, you know, about 10 meters away, so 10 meters off the bottom and sort of 10 meters downstream those concentrations are already less than 5 percent of what the concentration was that was coming out of the pipe.

And, you know, I think that's all -- that's all I had, I think. I'll hand it back over to you, Elizabeth.

MS. RANSOM: So what does that mean really? You know, part of what we're trying to help people understand is that we are starting with fairly low concentrations due to the level of treatment that Erik is doing in the facility itself. And once they get there, they're going to be further diluted by the dynamics of the bay itself.

So we hope that through this presentation you've come to understand that the treatment systems that are being used by Nordic Aquafarms are state-of-the-art. They're proven technologies for other industries that are being combined in new ways to make Nordic Aquafarms discharge one of the cleanest of its kind. This discharge will meet or exceed all of the applicable DEP standards and there

will be ongoing testing to demonstrate that is stays that way over time. This discharge will meet the sensitivity parameters that DEP and other organizations in New England have established for eel grass, which is a noted sensitive receptor that exists in the bay.

And I think with that, I'm going to turn this back to Joanna, who will start laying out some ground work for questions.

MS. TOURANGEAU: So momentarily, we are going to switch to the question and comment period for the discharge license process. I am going to need a couple of minutes to shift things around. We're going to move this podium back here and turn it around. I'm going to ask folks that want to ask questions about the MEPDES licensing to form a line here and be prepared to state your name and ask your question. I am -- we have this space until 9 o'clock, so we have plenty of time for questions, but I am going to ask that we limit the discussion tonight to the purpose of this meeting for the DEP, which is to address comments to the discharge permit. I understand that folks very likely have significant additional questions about other aspects of the project. Like I said earlier in the beginning of the

meeting, there will be additional public informational meetings to address and city meetings to address all of those issues.

I am going to run a clean meeting tonight. I am going to invite you all to be civil and courteous to address your questions and to provide your name so that the court reporter can get the information. We will make every effort to answer your questions tonight. As I also said earlier, if we cannot answer your question tonight it will be pulled out of the transcript and put into a list of questions with narrative responses that go with our application to the DEP. Please use your time not to provide significant comments about other parts of the project, but limit your comments to the discharge licensing aspects of the project. If you are not doing that, unfortunately I will interrupt you so that people that do have those questions can use the time that we have set aside.

At this point, I am going to start moving things around and then we will be ready for questions. I am going to stand up and try to direct traffic with the questions because we only have two microphones, so I am going to give one of those microphones to the podium for folks to use and I am

going to pass this one around like a baton so that folks that are answering questions can have it.

AUDIENCE MEMBER: Are we going to be able to go take a bathroom break?

MS. TOURANGEAU: Absolutely. It's going to take a second, so. Yup. We're going to do another one at 8, but this will take probably two minutes.

(Break.)

MS. TOURANGEAU: All right. It looks like we have a pretty long line here, so let's start moving back so that we can get to the questions and see if we can keep on track here. So like I said a few moments ago, I am going to field questions as they come in and try to pass them off to the correct person to the best of my ability, okay. Please, please if you don't mind, state your name before you start and if you have a complicated name that's hard to spell, if you wouldn't mind helping out the court reporter we would very much appreciate it. All right.

AUDIENCE MEMBER: Paul Bernacki, Belmont, Maine. B-E-R-N-A-C-K-I. Hi, Nate. Paul Bernacki, nice to meet you in-person.

MR. DILL: Nice to meet you, Paul.

AUDIENCE MEMBER: (Paul Bernacki.) My

questions are for Nate about his presentation about tidal flow.

MR. DILL: Nice to me you too, Paul.

AUDIENCE MEMBER: (Paul Bernacki.) What I'll do is I will as part of a sentence give you a series and I know you can keep up with me. So I'll give you a series of point issues that I'd like you to just respond to instead of grilling you in some way.

MR. DILL: Of course.

AUDIENCE MEMBER: (Paul Bernacki.) First is summer, winter, thermocline, seasonal, and climate variation, water solidity issues, especially in the subbay of the Little River estuary area, periods of slack tide especially during the summer when the tide ranges are a lot less and the flow is less, wind forcing such as the northeast storms and the prevailing summer southwest storms and how those affect your modeling and have you actually done any localized multi-water level drifter tests to prove out the model as opposed to just doing a mathematical model based upon the tide station at Fort Point which is about 7 -- 6 or 7 miles away by water and is really close to the eastern Penobscot Bay channel, which is much deeper. That's enough for the meeting

tonight. I tried to make it light.

MR. DILL: Okay.

AUDIENCE MEMBER: (Paul Bernacki.) Thank you, Nate.

MR. DILL: So I think the first thing that you mentioned to address has to do with the stratification in the water column. And I'm just going to go through these and then I can hopefully recall them again. The second thing has to do with seasonal changes. I guess that is in some way related to the stratification. Periods of slack tide, wind forcing and then localized tests -- localized observations, I think, I'll put it that way.

So to go back to the -- to go back to stratification, so there is sort of a wealth of data in Penobscot Bay at large that demonstrates that stratification is significant in the estuary, so what that means is you have -- you tend to have -- you tend to have water that varies with the season, so I guess we'll start with the -- with the spring season. The spring season you tend to have a lot of water coming down the river. That water is fresh water. The fresh water is buoyant. It tends to float on top of the denser salt water and so what happens is you

end up having multi-layers of water flowing and, you know, from other modeling and other data that I've seen out there this tends to create a sort of circulation in the bay where water on the surface tends to be transported out of the bay towards the ocean and water near the bottom tends to be transported more up the bay and that creates sort of a circulation, which to some extent increases mixing in some ways, but also because of the stratification it limits water from mixing within different layers. And so as we go on into the summer season you get less fresh water but the sun starts to heat up the water at the surface, so warmer water like fresh water is less dense than colder water and so, again, you start of maintain that stratification. And then as you get into the fall and, you know, the water is still pretty warm, you also sort of maintain that stratification, eventually you get colder weather and the colder weather starts to reduce the temperature of the water at the surface. And as you go and transition into the wintertime, so this is, you know, mid-winter, late winter, what happens is the water is cold at the surface. Everything is frozen in the watershed, so there is not a lot of water coming down the river and during the wintertime you get more of a

complete mixing so there is less stratification.
And so what have we done to address this? In the CORMIX modeling where we look at the near field, that initial mixing, that is in large part dependent on the stratification in the water column and the density difference between the discharge water and the ambient water. And so depending on how strong that stratification is and how -- and how different that density is between the effluent or the discharge water and the ambient water that initial mixing behaves differently. And so when you have times of the strong stratification what happens is the water -- the water is released near the bottom and so it's -- that water is fresher so it's less dense, but as it mixes with the denser water that's around it, it becomes more and more dense as it's rising in the water column. And under certain conditions -- and this also depends on the current speed, so it varies with the tide whether it's slack tide or high tide and the tide is going back and forth throughout the day this tends to vary, that discharge that's coming out will become trapped. It will either rise all the way up to the surface in some cases or it will be trapped within a layer below the surface but near the surface. And so what we've

done -- looking at the CORMIX results, we understand that this is going to be a buoyant discharge and that in many cases under most conditions through the seasons it's going to tend to stay in the upper part of the water column. It may come up to the surface and remain in a layer that's 5, 10 meters thick initially. And we're talking just initially within the first couple of hours after it's ejected from the pipe. And that -- and then during other time periods the current -- the tidal currents may be strong enough, the stratification may be weak enough that there is enough turbulence all the way through the water column that it might mix all the way from the bottom to the top. And so we've got to kind of understand that from the CORMIX modeling. We have a lot of detailed calculations from the CORMIX modeling.
What makes this very complicated is that it changes with the season and it changes with the tide and so as the tide transitions from slack tide to a full flood or a full ebb, the state of that behavior is going to change and that actually will tend to increase the dispersion and mixing of the effluent. So that -- I think that kind of addresses the -- I think somewhat addresses the thermocline, the

stratification issue and the seasonality.
I think I'll also talk a little bit about the tidal periods here. So you mentioned slack tides in the summer, that's a time when the stratification is strong and during slack tides there is not going to be a whole lot of ambient turbulence to mix things up, but that condition is only going to last for a couple of hours and then the current picks up and it will tend to increase that mixing. That's what we're seeing from the model.
So I'm going to move on here to wind. Wind forcing. So the two-dimensional model that we showed, the one where I showed the current arrows and then ultimately the ping pong balls and the ones that we used to calculate that nitrogen concentration, that model can be forced with wind. In this case, we did not force it. It can also be forced with waves. In this case, we did not apply any wind in the model and the reason for that is because wind can have a -- wind can have a significant effect on those currents and it can have an effect on the, you know, the surface currents more so than the bottom currents, but it can actually create, you know, three-dimensional circulation in cases. Wind tends to create more circulation. It tends to create more

turbulence in the water which leads to more mixing and wind also creates waves and waves tend to create turbulence in the upper layer of the water and that also tends to create more turbulence. So by not including wind in the model we have essentially made a conservative prediction. If we were to include wind and we were to include sort of naturally variable wind, we would see that you would -- that that -- that that area where those ping pong balls are moving would tend to spread out and mix more horizontally. That model is two-dimensional, so it doesn't -- it calculates a depth average current. So it doesn't -- it doesn't -- it doesn't calculate the current at different depth layers in the model. And so because of that -- and that's just a simplification of the model. It makes it easier for the model to solve the problem. Because of that, when we calculated the concentration we assume that all of the, I'll call them, ping pong balls were in the upper layer of the water column. So we assume that they aren't mixing all the way down to the bottom and so, you know, in some cases when the stratification is strong that's pretty reasonable. In other cases when there is more -- less stratification or there is more vertical mixing

that's a conservative assumption we would tend to -- we would tend to over estimate the concentrations from what you would see.

And I think it's also important to kind of reflect back on the fact that that vertical mixing and how strong that tendency to be trapped within the layer varies with the tide. So on one tide, you know, on one portion of the tide you may have the effluent being sort of trapped near the surface, but then when the tide changes and the current speed picks up it's all going to get mixed. And so as you go further in time, if you look at a ping pong ball that was released, you know, within an hour or two we can see from the CORMIX modeling that it may be stratified -- trapped in the stratification, but when you look two days later, the tide has changed four times already, there's a good chance it's going to be pretty well vertically mixed.

And then I guess I'll go to your final question, have we done any localized tests. I'm looking at where things would go and the answer is -- the answer is -- the answer is no, not really. We have the -- we have the water level data from core point. We worked with the available data that we have for this analysis. And so the -- and what we

have is water level data that was -- the closest data that we have that we can use to validate our model that's sort of a standard practice with this model is that you take the model results, you compare them to observations and then you demonstrate that the model is able to reproduce things that were actually observed and that gives you some level of confidence that the model is reasonably predicting other things in other areas where you haven't observed it. And that's really the -- the point of the model is to provide us with information in areas where we don't have observations. It is helpful the more observations you have the better confidence you can have in your model, but also the more observations you have the less you need the model. So I guess that's -- that's my response.

AUDIENCE MEMBER: (Paul Bernacki.) Just one follow-up.

MR. DILL: Sure.

AUDIENCE MEMBER: (Paul Bernacki.) Can you tell me what the planned temperature of the outflow water will be? Range?

MR. DILL: I might not get this right. I'm going to say is it 13 centigrade, I think is the -- is that...

MS. RANSOM: Give or take.

MR. DILL: Yeah, 13 to 16.

MR. HEIM: 13 to 16 Celsius.

MR. DILL: So if you multiply it by 9/5 and add 32.

AUDIENCE MEMBER: (Paul Bernacki.) And the salinity is still the stated three parts salt water to one part fresh water?

MR. HEIM: Mid 20s. Mid 20s parts per thousand.

AUDIENCE MEMBER: (Paul Bernacki.) What is that?

MR. DILL: The salinity of the discharge water is about 20 parts per thousand. Mid 20s parts per thousand. And that's, yeah, approximately what you'd get if you approximately mix one part fresh water with two parts salt water.

AUDIENCE MEMBER: (Paul Bernacki.) Two parts or three parts? Two parts or three parts?

MR. DILL: Approximately two parts salt water and one part fresh water.

AUDIENCE MEMBER: (Paul Bernacki.) And so the -- all of the water that's going into the various -- the smolt grow out and the grow out, all of those water temperatures will be combined in an

average temperature by the time they get to the outflow?

MR. DILL: That's my understanding, yes.

AUDIENCE MEMBER: (Paul Bernacki.) That's my understanding. Okay. Thanks, Nate.

MR. DILL: You're welcome.

MS. TOURANGEAU: Mr. Bernacki, can I also add to that to say that Nate did a wonderful job briefly summarizing two memorandums that are in that draft application, one on the near field modeling, one on the far field modeling and a pier review that was done by Ramboll kind of looking at both of those modeling reports. So that will all be in the actual application when it goes in and that will give a much more fulsome answer to your very helpful questions. Thank you.

AUDIENCE MEMBER: Hi. My name is Lawrence, L-A-W-R-E-N-C-E, last name is Reichard, R-E-I-C-H-A-R-D. I am from Belfast. And in the spirit of full disclosure, I am a columnist for the Republican Journal newspaper here in Belfast. My question is all of the facts and figures and the presentation that we've seen here this evening seem to be based on best case scenarios where nothing goes wrong. As Mr. Heim knows, I was recently in Norway

and Denmark and I spoke -- while on that trip, I spoke with Professor Are Nyland of the University of Bergen, and that's A-R-E, last name N-Y-L-A-N-D. And he said that regardless of what precautions are taken in filtering and such there is always a possibility of virus and disease in a land-based fish farm. And if and when there is an outbreak of virus or disease in a land-based fish farm then those fish will -- those tanks -- the affected tanks will have to be drained, all of the fish in them, probably hundreds of thousands, will have to be slaughtered and then those tanks will have to be cleaned.

My question is -- and I also I also -- I also spoke with Bent Urup, who I believe invented the RAS system that will -- that Nordic Aquafarms would use here in Belfast if they're successful. And he said that the cleaning mechanisms that Nordic intends to use here would not be sufficient to deal with the outbreak of a virus or disease, thus the tanks would have to be cleaned. My question is what chemicals will be used to clean the tanks if and when there is an outbreak of virus or disease in the tank?

MS. TOURANGEAU: Should I refer to Ian?

MR. HEIM: Yeah, go ahead.

MS. TOURANGEAU: So we are privileged

tonight that Mr. Ian Bricknell, who is a fish disease and sea life expert with 40 years of experience from the University of Maine has volunteered his time tonight to answer those kind of questions. Come on up Mr. Bricknell. B-R-I-C-K-N-E-L-L.

MR. BRICKNELL: Well, thank you for that question. That was really interesting. I'm a fish disease person. My PhD is in aquatic physiology and I've studied fish diseases for 39 years now. I know I look very young and dapper, that's just the way it is, but. It's all of the foreman I use.

But one of the things to bear in mind with this is it's like any farm, there is always a risk of disease. You're on the coast, a storm will throw up wild sea water, those aerosols can enter any farm and there is a risk to that. But of course that risk assessment is always part of any biosecurity plan and I'm sure that's been taken into account. So when it actually comes to the chance of those outbreaks occurring you can reduce that markedly by ensuring that the fish that are being ground are vaccinated against those diseases. And most of the common viral and bacterial diseases in salmon farming, and there are very, very good vaccines available. I know, I had a patent on one back in 1989 for aeromonas

salmonicida. And these things would eradicate those diseases as effectively as the polio vaccine did for polio in the United States. So I think if you're concerned about that one of the things that you'll need to make sure of is that the fish are vaccinated before they go in. And of course like any other form of farmed animals, if the animal has had an accident they go on to veterinary care and of course there will be antibodies used in that.

Now, looking at those filtration systems, I don't see how they can make those comments about them not being adequate without actually looking at the discharge rates, looking filter efficiency based on that science, which I don't think are available yet.

AUDIENCE MEMBER: (Lawrence Reichard.) I didn't say that.

MR. BRICKNELL: Well, I thought you said that you were looking at the chemicals that were going to be cleaning it and you were saying that the diseases were going to occur.

AUDIENCE MEMBER: (Lawrence Reichard.) And you said yourself that that is possible.

MR. BRICKNELL: It is, but you're going now through a .4 micron filter. Well, that's about the quarter of the size of the bacteria, so all of the

bacteria will be trapped in those filters under those situations. I mean, this is the way sterile blood products are made, for example, for transfusion of plasma or saline. They are often ultra filtered to remove all those bacteria.

AUDIENCE MEMBER: (Lawrence Reichard.) So you yourself said that disease outbreak is possible. Can you answer the question, what chemical will be used to clean the tanks in the event of a disease outbreak? You have not answered the question.

MR. BRICKNELL: Well, I'm not -- I'm not the person who is going to discuss their biosecurities for cleaning the tank because it's --

AUDIENCE MEMBER: (Lawrence Reichard.) Well, that was the question.

MR. BRICKNELL: Well, I'm talking about the actual disease component that you are suggesting. Now, there are many things you can clean the tank with, hydrogen peroxide, hypochlorite, iodofols. There is books on this. I mean, it's a standard thing. This is something that any veterinarian could advise you on as part of their training.

AUDIENCE MEMBER: (Lawrence Reichard.) Are you aware that there was a study released just this summer that linked the use of hydrogen peroxide,

which is the most common chemical used to clean fish tanks that this was linked to the -- to death of crustations?

MR. BRICKNELL: It depends on the study you're talking about. Do you have the author's name?

AUDIENCE MEMBER: (Lawrence Reichard.) Are you aware of any such study?

MR. BRICKNELL: Well, it depends on the concentration. If you take crustations and put them in a hydrogen peroxide solution they will die.

AUDIENCE MEMBER: (Lawrence Reichard.) Well, yeah, I suppose that's true.

MR. BRICKNELL: It is very true.

AUDIENCE MEMBER: (Lawrence Reichard.) Yes. So they -- so hydrogen peroxide is toxic to crustations.

MR. BRICKNELL: It's toxic to you. If you go and eat hydrogen peroxide you will be dead in half an hour.

AUDIENCE MEMBER: (Lawrence Reichard.) Okay. Well, I'd still like to know what Nordic Aquafarms intends to use to clean those tanks.

MR. BRICKNELL: Well, I'll push it back to you.

MS. TOURANGEAU: Thank you, Dr. Bricknell.

Erik.

MR. HEIM: So just a couple of comments. First of all, Bent Urup has not designed our systems. We were involved in an investment project with him in Denmark and he has no --

AUDIENCE MEMBER: We can't hear you.

AUDIENCE MEMBER: Can't hear you.

AUDIENCE MEMBER: Use the mic.

MR. HEIM: I'm sorry. Bent Urup has not been involved in any designs that we are looking at in Norway for further developments and also in the U.S. just to make that clear. He was involved in an early investment we did in Denmark and did designs for that. We are way beyond that level today just to set the record straight on that. He has no involvement in our business. He was an early entrepreneur that was involved in our Danish operation and is now currently doing other things just to set the record straight on that.

In terms of cleaning, so in terms of pathogens in general the main thing is to keep them out and that's what the system is designed for and then you always have worst case scenarios with humans, animals or anyone that you can never be 100 percent sure about preventing disease. So what we

are doing is to prevent that as much as possible.

Now, in terms of cleaning it really depends on what you are looking at. There is no one answer to that. There is a variation of cleaners you can use and they will all be listed in our permit application. Hydrogen peroxide, generally something we avoid. I am not a big fan of it, but it is something that is used in the industry. We will be looking at other substances and there is going to be a range of them listed in the application. So I would advise that you take a look at that when it comes. It always will depend on the circumstances of what we are dealing with.

What I can say is we run our facilities in Denmark for three years, we have never had disease. So the point here is really to reduce the risk of disease and that's what the whole set up is designed for also here in Belfast. It's just like flying an airplane, there is always a risk it will fall down from the sky but I still fly, you know, because the risk is much lower than it was many decades ago. So that's where the industry and we are going is the preventative measures.

And I'd like to say finally it's impossible for a professor in Norway who doesn't understand our

designs and what we've done to comment on our technology. We are way beyond what you typically see in small facilities in Norway today in terms of these technologies.

AUDIENCE MEMBER: My name is Mary Bigelow. That's B-I-G-E-L-O-W. I live in Belfast. I want to thank you for this presentation. I've been hungry for numbers for months, so I'm glad to finally see some numbers. So thank you.

One question I do have, even though I totally am encouraging you guys, will there be a sampling manhole which the state or the municipalities could have access to without having to ask permission from Nordic Aquafarms? Is there any plan for such a thing?

MR. HEIM: So the discharge data? I'm sorry, you mean discharge data?

AUDIENCE MEMBER: (Mary Bigelow.) No, a sampling manhole so that if --

MR. HEIM: What's that?

AUDIENCE MEMBER: (Mary Bigelow.) -- if, for example, heaven forbid you didn't last at this site and somebody else bought it --

MR. HEIM: Yeah.

AUDIENCE MEMBER: (Mary Bigelow.) -- and

then we suspected they weren't behaving themselves, it's really sometimes good for the municipality to have a manhole outside the property of the industrial plant, which has -- which can be accessed, padlocked and what not that would permit sampling by the state or the municipality.

MS. TOURANGEAU: So our MEPDES permit should it issue will have sampling criteria --

AUDIENCE MEMBER: (Mary Bigelow.) Yup.

MS. TOURANGEAU: -- and will require quarterly testing that will go to a state accredited lab with chain of custody and all those things. The DEP will be able to come on site at any time and validate those data. And, you know, the manhole, I'm not sure that that idea would work because the discharge system will run from the wastewater treatment plant on land via pipe out to an outfall, so what we are talking about are monitoring stations that are around the outfall, but a manhole would have to go down through the water to the pipe, so I'm not sure that I 100 percent understand your question.

AUDIENCE MEMBER: (Mary Bigelow.) Where I'm coming from is I'm a former chief operator of a wastewater treatment plant in Vermont and not in my town but in a different town there was a terrible

problem with a very green supposedly producer dumping large amounts of cream, milk and sugar down the drain and they could never catch them. And they finally ended up having to put manholes in because the industry denied everything and as soon as they got those manholes in there was peace in the kingdom.

MS. TOURANGEAU: Hmm. I think that our equivalent of manholes here would be the kind of background monitoring system that we're talking about including as part of the permit that would be -- and maybe I'll turn it over to Elizabeth to talk about that a little more because I'm not familiar with the specifics, but I think that would be the equivalent of the manhole.

MS. RANSOM: I do know, Mary, there has been some discussion about, you know, we've started, as I said, to get some background data from the bay itself --

AUDIENCE MEMBER: (Mary Bigelow.) Yup.

MS. RANSOM: -- because obviously not only do you want to know what they're putting into the pipe, but you want to understand what the effects are out in the bay. So there has been some discussion about maybe having some of that sampling not just done by Nordic and the people Nordic pays for but

whether or not that might be something where there are either university or community or other representatives that are involved in that and so that would allow for some impartial non-paid by Nordic people to be having a way to get at the evidence directly as to what's going on versus having something that comes through a Nordic monitored program.

AUDIENCE MEMBER: (Mary Bigelow.) In extreme cases such as what happened in this adjacent town in Vermont, they ended up putting a sampling device down the manhole and they could say X number of gallons at such and such concentration during this hour, this hour, this hour. It did not leave any room for the industry to say, oh, it's background, it's not me, it's my neighbor. It's just right on the pipe.

MS. RANSOM: I understand. I'd be interested in actually getting some of the details from you and perhaps we can kind of take it off-line --

AUDIENCE MEMBER: (Mary Bigelow.) Yup.

MS. RANSOM: -- because obviously this pipe is going to be under, you know, buried and, you know --

AUDIENCE MEMBER: (Mary Bigelow.) Sure.

MS. RANSOM: -- with a significant water column above it, so we --

AUDIENCE MEMBER: Couldn't it be on land?

MS. RANSOM: Yeah, that's what I -- I'd be curious, like I said, to get some details from you when we can talk about it.

AUDIENCE MEMBER: (Mary Bigelow.) Okay. And I really applaud the work you've done tonight. Thank you.

MS. RANSOM: Thank you, Mary.

AUDIENCE MEMBER: Good evening. My name is Chris Wright. That's with a W. I'm going to ask a different question, but I guess thinking about the concern for what happens and what are the chemicals or whatever that are used or if there is a virus or bacteria that slips through the filters, the ultraviolet, et cetera, of course, it's in everybody's interest -- everybody's interest that that not happen. But in the event that it does happen, we would like to know what is used to clean such large tanks with very large amounts of water, 10s of thousands of fish. We need to know what happens if that happens and that's not out of the realm of possibility. I don't think anybody would

ever say it is. So that's -- that's my most important question.

MS. TOURANGEAU: I can turn this over if you want more detail, but I do know that the -- one of the components that will be an exhibit to the application to the DEP when it's submitted is a chemical list and that chemical list will include every chemical that will be used at the facility including all of redundant chemicals meaning, you know, certain ones need to be rotated and used differently for cleaning products so that, you know, resistance doesn't build and that kind of thing. And I'm not a scientist, so others can -- David Cyr can...

MR. NOYES: Hi. My name is David Noyes.

MS. TOURANGEAU: David Noyes, sorry.

MR. NOYES: I'm the CTO for Nordic Aquafarms.

AUDIENCE MEMBER: We can't hear you.

MR. NOYES: So I've spent about a decade now working in RAS facilities and I can assure you that the majority of the cleaning is done with elbow grease and manpower. But recently there have been a lot of fantastic robotic cleaners that allow continuous non-stop cleaning of the tanks and so you

don't have to get to that level. We've employed them recently out at the USDA and I absolutely advocate for them because they save an immense amount of manpower and basically allow you to achieve this magnificent amount of constant cleanliness in the tanks and the systems to prevent any buildup of any organics.

AUDIENCE MEMBER: (Chris Wright.) I'm sorry, that doesn't answer my question at all. That sounds great that there are ways to clean the tanks that are on a scheduled regular basis. What I'm asking you is what happens if the facility in Belfast faces a viral or bacterial outbreak and things have to be cleaned up? What do they clean it up with and it would really not -- we don't want to hear about a list of chemicals. We'd like to know what the chemicals are, but aside from that what happens to all of the fish and all of that water that is now infected? And we don't have to -- this doesn't have to be hypothetical. I'm sure there are cases in the industry someplace that you can refer to.

MR. HEIM: Sure. Just a couple comments in the case --

AUDIENCE MEMBER: Louder.

MR. HEIM: Okay. So and I think it's very

healthy to always think about worst case scenarios. I mean, anybody working with either humans or animals should take that into consideration. So our primary source of potential disease is the bay just to make it clear because eggs we bring in go through quarantine and health certificate testing with veterinaries in Maine, so these are isolated systems. So if we were to come in a scenario where a disease comes in it depends on what it is. Typically, what you will see in the industry if there is a detection of disease you will take in a veterinary -- authorized veterinary right away to asses the appropriate way of dealing with it. And in the U.S. one form of treatment can potentially be described depending on what it is. It's difficult to generalize because it can be different things.

Worst case scenario in the industry is they slaughter out the fish from a tank due to disease situation and that's typically that our slaughtering facility is or the processing facility is prepared to do. And, again, what the -- what is done with that depends on what it is. One way of dealing with it is to grind it up and also put it in diluted acid solution to neutralize bacteria in it. This is a common practice in the industry. And this happens in

sea pens as well. In terms of the tanks, typically if you have a tank with disease, you will empty it out, it will go through the same biosecurity measures that we just discussed and given the strength of those we are not in the situation where we need to disinfect with chemicals this water because we have high grade water filtration equipment in this facility that will take bacteria, that will take virus. Typically, what we will do is to empty the tank and let it sit dry for a longer period of time and you would dry clean it out with chemicals depending on what you have that are approved in the U.S. for this purpose. And that means that you're not really discharging large amounts of this cleaner out into the ocean. You will let the tank sit dry probably for a number of weeks, maybe months depending on what it is. So every scenario here, I mean, there is experience in the industry with dealing with various kinds of virus if they should occur and the answer to each situation is a different solution depending on what it is.

AUDIENCE MEMBER: (Chris Wright.) So do I understand you correctly that the water might actually be evaporated so you're not dealing with hundreds of thousands of gallons of infected water?

MR. HEIM: In the cases where you cannot efficiently treat -- let me make it clear, there are first of all, vaccinations to prevent this for a number of the common diseases. In the worst case scenarios where you cannot treat there will be a solution to do a short-term treatment solution for this. Your alternative then is to take out the fish and you would empty out the tank, the water would go through those biosecurity measures I just described, which is drinking water grade cleaning equipment. In other words, it's safe to drink that water basically if it hadn't been for the salinity. It's typically the type of treatment you would also be using for drinking water in some areas to prevent virus and bacteria infections. And that results in emptying out the tank, you let it dry out and you can do surface cleaning or equipment cleaning with the appropriate cleaner that a veterinary prescribes. That's the way it is. And that also means that you're not really emptying huge amounts of cleaners into the ocean. This will dry out and be washed out afterwards with water, probably -- probably weeks or months after a dry out period. But, again, it depends what it is, yup.

AUDIENCE MEMBER: (Chris Wright.) Thank

you. I have one more quick question on the ping pong balls. So it seemed to me watching those ping pong balls that they didn't actually leave the bay; is that correct? I mean, and what I was paying attention to at that point when I was watching the ping pong balls was solids. So those solids will all stay in the bay or generally stay in the bay?

MR. DILL: Yeah, so that's a good observation. The tidal excursion -- so if you were to put a ping pong ball in the bay out there now and watch it go for a couple of days it's not going to leave the bay. It depends on where you put it though. Over time with the tidal current and the other -- there is actually a residual current and I don't know if you were watching it you could see some of the redder or oranger ones that started out more north in the bay. Those -- they migrate and they migrate slowly and what we saw that if -- when you look in Belfast Bay itself, so if you look at a drifter that was placed in Belfast Bay it takes about -- after about two weeks or so it will find its way out into -- into the sort of mid-Penobscot, lower Penobscot Bay. This depends a lot on what the river currents are doing. It depends a lot on what the winds are doing. But, yes, you're right, it is a

good observation that the -- the Penobscot Bay is not a small bay. There are a lot of small bays where the amount of water that comes in and out with the tide can go all the way out in the ocean on one tide and then get washed down the shore. Well, this is a very, very large bay and even though the tide range is very large, the -- there is not enough -- it's not enough of an excursion to actually push it all the way out of the bay on every tide. So you see -- but you do see over time, you know, up to two weeks that those -- that those particles do actually migrate away from Belfast Bay and, you know, but there will also be other things that are migrating in from other places, so it's -- and if you -- if you watch it more carefully there tends to be some circulations. And this has been documented in some other studies too where in one case, you know, and there is some conflicting evidence and I think it probably has to do with differences in the river discharge, differences in the stratification and the densely driven currents in the bay that sometimes you might -- you might find that there is sort of a circulation that goes counterclockwise, you know, around Islesboro and then other times you might see circulation go the other way around Islesboro. And

actually if you look at the results just from the simulation that we did it was about a month long simulation you can see that actually some of those particles that go counterclockwise around Islesboro they start drifting counterclockwise and there are some other ones that start drifting clockwise around Islesboro. The ones that tended to be further to the south tended to go clockwise and the ones that were to the north tended to go kind of up in the Belfast Bay and then come down around the west side of Belfast Bay.

AUDIENCE MEMBER: (Chris Wright.) You know, I guess my concern was so the solids that come out of -- if they don't go say make their way out to the ocean some percentage of them ends up in the bay.

MR. DILL: Yeah. I think that if the -- well, actually what we see from the information is that the amount of solids that will be coming out of the discharge is less than what is currently in the bay. So this system -- the proposed system is filtering solids out of the bay.

AUDIENCE MEMBER: (Chris Wright.) Thank you.

MR. DILL: You're welcome.

AUDIENCE MEMBER: I'm Natalie Charles. I

live in Belfast. Natalie is N-A-T-A-L-I-E. The historical and recent status of Penobscot Bay lists it as Maine's largest and most productive fishery and estuary system. It is also known as one of the most significant estuaries on the eastern seaboard. It can produce high quantities of wild fish, but has been severely mismanaged detracting each of the regional ecosystems, the economy and the culture. The waters and rivers have been cleaned considerably since the days of chicken processing and many industrial polluters have gone out of business, left the area or reduced their outflow. At this critical time, you are proposing to locate a 7.7 million gallon per day outflow pipe deep within the estuary not even close to deep ocean currents. Can you please provide scientific evidence -- hard scientific evidence to support your claim that the overflow would indeed be in deep ocean currents and have no negative impacts on the bay and its recovery. And I would like to see scientific articles and I'm happy to leave my email address here.

MS. TOURANGEAU: Thank you.

AUDIENCE MEMBER: (Natalie Charles.) You're welcome.

MS. TOURANGEAU: Could you -- would you mind

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writing your email address down for me?

AUDIENCE MEMBER: (Natalie Charles.) Sure. That would be great.

MS. TOURANGEAU: Do you mind if I proceed to other people while you're --

AUDIENCE MEMBER: Do you want to answer her question? She had several questions there I thought.

MS. TOURANGEAU: I thought she had asked for more scientific articles on those issues to be emailed to her.

AUDIENCE MEMBER: (Natalie Charles.) If you could address what you can that would be great.

MR. HEIM: Well, I guess the water questions is more -- I think we have addressed it, but we can summarize it again.

MR. DILL: I'm not sure if I heard the first part of your question. The -- you did ask to provide evidence that the discharge would be in deep ocean currents. I think the answer to that question is no. In order to reach deep ocean currents you would have to go hundreds of miles off shore and that -- it's just simply not practical to put a pipe hundreds of miles off-shore. And from what -- from what -- what we've done -- in the analyses that we've done that's not necessary. The -- within the -- within the

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estuary that -- the discharge within the estuary -- and this is pretty much every wastewater discharge is like this, I'm not aware of any, you know, there may be some locations where the deep ocean is right next to the shoreline that you can actually discharge wastewater into the deep ocean. You know, the analysis of the concentrations and the dilutions indicates that it's not -- that the concentrations of nitrogen aren't going to be high enough to impact, you know, what evidence we have that suggests we're at a threshold level. So even that discharge into the estuary it should be sufficient and that's what we're looking at. And I don't know if you can maybe reiterate your question.

AUDIENCE MEMBER: (Natalie Charles.) Well, if there were -- you could send, again, articles, peer reviewed articles that prove what you're saying, that agree with what you're saying that would be helpful.

MR. DILL: Okay.

MS. TOURANGEAU: Thanks, Nate.

AUDIENCE MEMBER: Hi. I always like to just sigh hi to everyone in the room so I feel a little bit more human. My name is Ethan Hughes and I'm a resident of Belfast and I also have a background in

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science conservation and long explanations are typical in the field of science. We have given the respected time for answers from many of your experts even when they're not answering our questions. I ask you to please give me the same respect. I want a reminder to Nordic and Erik that you are guests in our country and not the other way around and please honor your hosts. I appreciates the local police presence just in case Nordic gets a little out of hand.

MS. TOURANGEAU: We're wild. We're wild and crazy.

AUDIENCE MEMBER: (Ethan Hughes.) It would be great if you were wild enough to do wild salmon, but that's another conversation. I just want to note the elephant in the room that there is it a power imbalance with citizens and corporations. You can stop our sharing, but we can't actually stop yours. And I just want to invite that it would be wonderful for Nordic to start having a equal power sharing with the citizens. That would be great.

And so now I have a question for Erik specifically. Thanks. So you seem very sure about the safety of this experiment and I actually admire that confidence, but why does the President of the

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International Salmon Farming Association, John Davidson, in his report of 2016 state that he is -- the entire association is against land-based aquafarms because of disease, effluence, carbon footprint. They say no to raising Atlantic salmon to adults. It's illegal to be organic when they're in the tanks and there is cramped conditions for the fish. The Scottish salmon producer organizations also frame it as Atlantic salmon land-based is an environmentally unfriendly option, not financially viable. I urge you to read these reports for the sake of the bay and for Belfast to balance your confidence with some of this humility that there is actually other world experts that are coming up with very different conclusions than Nordic. And, yeah, I think that would be great. I can point you to those write-ups.

And now I'm going to tend with my question. So the way you frame this experiment it sounds great. Jobs, clean tax, clean water, tax support, great filtration, cutting edge, economic boom. The population density in Europe is much higher, so actually you had a concern about less flying by being in Maine, why not go to Norway? Surely you don't want to rob the Norwegian's of this incredible

opportunity if it's so incredible. Why come to Maine? Well, Norway is too regulated for a farm of this scale that's experimental. You don't have the permits. So for an entire country you're going to do 10 times the amount that are permitted in Norway in just one town. So Norway is too strict for your experiment, so you have come to Maine because the U.S. offers less strict environmental, socioeconomic and hydraulic restrictions and also regulations for 7.7 million gallons a day of effluent into the bay is okay in the United States, so welcome. And here is my question. Tell me, Erik, will 7.7 million gallons of effluent released daily into the bay have no ill effect? 7.7 million gallons daily have no ill effect to the bay and its ecosystem?

(Applause.)

MR. HEIM: Well, I believe that's what we've been trying to answer today.

AUDIENCE MEMBER: Please hold the microphone up.

MR. HEIM: Yeah. So in the end I don't think the quantity of water matters, it's what it contains and that's what we've been trying to focus on today. So and that's been very important for us to address that exactly what that contains. So and

if you look in general we are taking water and putting water back, as long as you don't add things that eventually harm an ecosystem that's been our goal and what's what we're aiming for.

As far as the other comments are concerned why not Norway. We are expanding in Norway. There are farms the same size being permitted in Norway right now. The reason we're here is that the CO2 equation you're referring to, when you buy a salmon from Norway it's three times higher than if you produce it locally because of airfreight. And over 90 percent of the salmon sold in this country are airfreighted into this country with three times the CO2 than if you produce it locally, so there is an environmental argument for that.

As far as -- as far as comments from some of these people, it's important to be aware of that the sea pen industry has been fighting land-based because they perceive it as a threat. In Norway, they perceive land-based to be a threat to the natural advantage of Norway salmon production. They don't like people coming into this industry because it's a competitive concept, so you will definitely find people in the industry who will talk against land-based, but you will also find many environmental

organizations who praise land-based including the Atlantic Salmon Federation, who has been quite clear about their view on this, and also the Monterey Seafood Watch, who also rates seafood in terms of standard sustainability. So I think like anything, there is always going to be people who have different views and that's fair, we respect that and I'm familiar with all of them. And we do read them and we do talk to what they write and we do listen to them and we have dialogue with them and that's fair. I think that's the way it needs to be. Just like sea pen is a big discussion topic in the U.S. and has its own issues as far as I'm concerned.

AUDIENCE MEMBER: (Ethan Hughes.) Yeah. Thanks. You're really articulate, but you didn't answer my question. And I also wanted to add you said as long as you're putting water back into the bay, but there will be another hundreds of millions a year of gallons of fresh water that are coming from aquifers into the bay, so that's a new water coming in.

MR. HEIM: So that additional -- I can answer that additional question. We did address that in the earlier meeting. So if you look at the Little River, it's the end of a big watershed. And this is

something that's been mapped by Ransom over here. This watershed empties into that area of the Little River. Some of it goes surface, some of it goes through the ground. All of it empties out in the bay in this area. So we are just taking a part of that water that was otherwise going to the ocean, borrowing it for a while, treating it and sending it in the same way it was going in the first place.

AUDIENCE MEMBER: (Ethan Hughes.) Some of those are protected deep wells aquaculture, you know, I mean, they're not moving into the bay. They're in -- that fresh water is protected and sealed.

MR. HEIM: We can have Ransom, who has been doing the modeling and investigation on that.

AUDIENCE MEMBER: (Ethan Hughes.) I actually want to ask you the question again. Just tell me will the 7.7 million gallons of effluent cause no harm to the bay, yes or no?

MR. HEIM: I cannot see that with what we described today that it will cause harm to this bay.

AUDIENCE MEMBER: (Ethan Hughes.) Okay.

MR. HEIM: That's why we have also got independent parties to review that to conclude on that because for me personally that's also priority. It's bad business for us if we cause harm to the bay.

AUDIENCE MEMBER: (Ethan Hughes.) And that's the reason I'm very suspicious because there is no way to do 7.7 million without impacting the system, so I hope you do some more research. Thank you for your time.

MR. HEIM: Okay. Yup.

MS. TOURANGEAU: Thank you, Mr. Hughes.

AUDIENCE MEMBER: Do you want to...

MS. TOURANGEAU: Um... How are folks feeling? Should we take a quick break? Is everyone all right?

AUDIENCE MEMBER: No.

MS. TOURANGEAU: Keep going.

AUDIENCE MEMBER: Good evening. I'm Andy Stevenson. I'm a resident here in Belfast. And I have a couple of questions and I'd like to start with Mr. Heim. In your presentation earlier you mentioned and I think I either heard it wrong or I didn't understand it completely, but you said that none of the permits in Maine have limits for nitrogen or phosphorous. Did I misunderstand what you meant?

MR. HEIM: I can answer that briefly or actually, Elizabeth.

MS. RANSOM: Yeah, I can answer that. Hi, Andy. The majority of permits -- MEPDES permits that

are written in the State of Maine do not yet actually contain limits for nitrogen and phosphorous within the permits. There are generally limits provided for BOD and TSS and then there is a requirement to monitor for those compounds but there are not generally limits set. That being said, the trend at the moment is to start adding those limits. So we would not be surprised to find a requirement in the actual permit that's written for this project. But if you look up and down the coast, I think you'll find the majority of the permits that are out there from primarily municipal treatment plants, but also some of the other industry permits that are out there, I think you'll find the majority do not actually contain a limit for nitrogen and phosphorous.

AUDIENCE MEMBER: (Andy Stevenson.) Okay. All right. So that answers my question. We're talking about permits for primarily publicly owned treatment plants?

MS. RANSOM: That's correct.

AUDIENCE MEMBER: (Andy Stevenson.) Okay. Second, Mr. Heim, you talked also about the monitoring about the reporting program which is great and the fact that DEP and U.S. EPA can come and look

at your records and your reports at any time. Would there be any interest in having the public be able to come in and look at those records as well?

MR. HEIM: Well, what I would expect is that the DEP eventually will define what is required and what they'd like to see. I don't know the procedures of the DEP in terms of making public records, but certainly that could be a part of the procedure so that the public would have access to whatever report. I don't know, again, but maybe Joanna can comment on that.

MS. TOURANGEAU: All of the testing and monitoring and sampling results that are submitted to the state, anything that's submitted to the DEP that's required as part of any monitoring program will automatically be a public record.

AUDIENCE MEMBER: (Andy Stevenson.) Okay. All right. And would be available from DEP but not necessarily from Nordic?

MS. TOURANGEAU: It varies. Sometimes they'll put it right up --

AUDIENCE MEMBER: (Andy Stevenson.) Yeah.

MS. TOURANGEAU: -- and sometimes they'll ask the regulated entity to make it available.

AUDIENCE MEMBER: (Andy Stevenson.) Okay.

MS. TOURANGEAU: It varies. And we'll know more when a permit -- when and if a permit issues.
AUDIENCE MEMBER: (Andy Stevenson.) Okay. So on that point, I would suggest that Nordic consider having those records available at Little River at the facility as part of your public or your community outreach program.
Moving on. Mr. Dill, man, I've got to tell you, I'm a water quality monitor and I love the little ping pong balls. That was neat. But the ping pong balls are only showing us what's happening on surface, correct? I mean, it wasn't a full water column modeling simulation.
MR. DILL: The hydrodynamic model, the far field model is a two-dimensional depth average model, so it's an estimate of depth average currently.
AUDIENCE MEMBER: (Andy Stevenson.) Okay. Okay.
MR. DILL: We made an assumption that based on the CORMIX results which does give you three-dimensional information that the -- in order to calculate the concentrations that the ping pong balls would all stay within the upper 10 meters of the water column --
AUDIENCE MEMBER: (Andy Stevenson.) Okay.

MR. DILL: -- so they're not mixing down into the deeper parts of the bay.
AUDIENCE MEMBER: (Andy Stevenson.) Okay.
MR. DILL: And we think that that's a conservative assumption because over time you would tend to get more mixing especially in the sort of far field time scales when you're looking at days to weeks rather than just the first, you know, hour or so after the effluent leaves the pipe.
AUDIENCE MEMBER: (Andy Stevenson.) All right. Then would it be accurate to say that there has not yet been any modeling or actual sampling information about water quality below let's say that 10 meter or that level?
MS. RANSOM: Actually, I can take a piece of that. So there are in addition to sort of some of the publicly available data for, I mean, I think it even goes to even -- some of the samples maybe go as deep as 100 and -- about 60 meters down, but we've established some sampling stations where we've been looking at the water quality at 5 meter intervals from the surface down to the depth of where the discharge pipe is proposed.
AUDIENCE MEMBER: (Andy Stevenson.) Okay.
MS. RANSOM: So we have some data that has

been gathered over the course of the past several months and we will be continuing to gather data as the project goes on so that we can, you know, have an understanding of not just one elevation surface or bottom but several elevations.
AUDIENCE MEMBER: (Andy Stevenson.) Would you be able to tell us a little bit more tonight if time allows about the monitoring and assessment that you plan to do between now and the time you start construction given that a permit might be granted?
MS. RANSOM: I think some of that will be something that comes out through the draft permit process through discussions with DEP. Obviously we want to make sure that whatever we're proposing is something that they feel is a good thing as well. So but what that might look like is you would look at, again, multiple depths, also multiple seasons and as we've been doing you would be looking at that during different portions of the tidal cycle because obviously things that you're seeing during an ebb tide might be different than during a flood tide.
AUDIENCE MEMBER: (Andy Stevenson.) Right. Okay. As far as monitoring the effects of the effluent on the marine environment I'd like to offer a wild suggestion tonight, which is that in addition

to what I'll call mechanical sampling or chemical sampling or automated sampling or even hand sampling, Nordic Aquafarms considers putting in what I would call a three-dimensional biological sampling operation, which would essentially be a full water column installation of kelp, seaweed, muscles grown on ropes vertically and clams caged on the bottom as a way to reassure people over the long haul that the viability of the bay as a source for additional aquaculture or any other harmonious installation could be preserved.
MS. RANSOM: I think that's an interesting concept. I think we'd have to obviously get some input from some of the folks at DEP. I know, for example, the clam flat at the discharge area has been closed for some time, so I think that particular piece might, you know, require some additional input, but I'd be happy to speak with you further about what you're proposing.
AUDIENCE MEMBER: (Andy Stevenson.) Okay. Well, the people who know it far better than I are a group called GreenWave and I believe they're in Connecticut. They focus mostly on the West Coast, but they've developed this concept and I'm sure they would be happy to talk with you.

MS. RANSOM: Awesome. Thank you.
AUDIENCE MEMBER: (Andy Stevenson.) Yeah. All right. I think that's it and I want to thank you all for the opportunity to talk tonight. Thank you.
AUDIENCE MEMBER: Hello. My name is Audra Novine McTague. A-U-D-R-A, M-C-T-A-G-U-E. And my question is regarding the time frame of your research. You said that the research that you presented was for the time period of one month and I'm assuming you guys are going to be here longer than that. And it is critical for operations like these to look at a time frame that is long-term and I mean 20 years or more. And so I'm wondering if you've done this research and what you have found.
MS. RANSOM: Great question. Let me do some clarification.
AUDIENCE MEMBER: Can you repeat the question?
MS. RANSOM: I'm sorry.
AUDIENCE MEMBER: Can you repeat the question? I couldn't hear.
MS. RANSOM: Sure. Her question was that she had understood from the presentation that we had been gathering data for about a month and that given the longevity of the project it was important to have

a much longer time frame of monitoring in order to understand potential impacts and I'm paraphrasing a bit there, but I think that's the gist of it.
MS. TOURANGEAU: Is that accurate?
AUDIENCE MEMBER: (Audra McTague.) Yes.
MS. RANSOM: So first of all, we've been as a consultant gathering data over the last several months, but there are -- and the reason for that is because we wanted to get some things as we narrowed down sort of where might that pipeline actually go, we wanted to narrow down things that were right at that discharge point. There have been, however, studies that have been going on in the bay since the 1970s and so there is a dataset for other areas within the bay that we can use to start establishing what does it look like historically, how has it changed, what are the different effects you might see at different times of the year, what are the different effects you might see upgrade or downgrade and upflow or downflow during different tide cycles. And so we've not only looked at our own dataset, but at some of the data that exists from other studies. So we have data that comes from the 1970s. We have data that comes from, you know, 2001 through 2010 provided from another study. So those datapoint

however some of them are, you know, maybe a kilometer from where we're discharging, so we're just now starting to make sure we gather data that is closer to the point that we're discharging so we have a more in-depth understanding of the place we're going to be proposing. And then as we mentioned, the intent is to have that be something where we can keep making comparisons going forward and the ultimate program is something that we expect the state is going to want to weigh in on and help us develop something that they feel is a sound approach to monitoring. But, you know, the permit process doesn't just stop when Erik gets his permit. He is required in his permit should they issue one to keep monitoring his discharge for as long as that plant operates and there, you know, there will be things that keep going into next decades.
AUDIENCE MEMBER: (Audra McTague.) Based on the these studies, what do you expect the long-term effects of your discharge to be?
MS. RANSOM: That's a good question. You know, we are looking at various different parameters and we have, you know, tried to the best of our ability to predict what we think is going to happen over time and, you know, obviously as we mentioned

some of the things he's discharging are actual improvements over what the bay has right now. So, you know, is, you know, I think we showed earlier a statistic that says his discharge is going to ultimately be less than one percent of the run-off that is currently coming into the bay for nitrogen. And so, you know, is he going to have a strong impact on the bay with anything he is discharging? No, because that bay is many trillions of gallons of water and he's discharging, you know, a small fraction into that. But over time, you know, you have things that are being discharged in one specific area over time we hope to see that, you know, the things that he's improving because he's treating and cleaning will potentially show some improvements and we hope that the things that we are discharging are not going to have the negative impacts. And, you know, we think that with the studies we've done, the modeling we've done, we've demonstrated that there should be no negative impacts. But, you know, we're going to keep monitoring to make sure that that's true.
MR. DILL: Can I say something about the modeling? I think you -- you mentioned -- you did mention the one month time frame and I think that may

be because of the modeling that we showed it was a one month long simulation. Actually, the model simulation was actually 45 days. It was actually a little more than a month, but the initial part we just kind of cutoff because when you -- with this kind of modeling you have to spin up the tidal forcing, you know, so it's initially the water is perfectly still and it takes a couple weeks for the hydrodynamics to create a realistic current. At that point, then you can -- then we -- we compared the water levels to -- the observed water levels and showed that they were pretty accurately reproduced and so the currents are pretty accurate.

And I think one of the questions that I had going into this was, well, how long does the water in Belfast Bay stay in Belfast Bay. And so this is, you know, typically you might call this a residence time. So trying -- so this is one thing that we -- that we really wanted to understand because this is -- this is actually really important for understanding what these impacts are. And if you look at the results of that, you know, if you look at the tidal currents and the result of that simulation and one of the reasons why we do a one month long simulation is that's the amount of time it takes for the moon to go through a

full cycle and so you go through a full spring neap tidal cycle, which is really representative, you know, it's sort of enough -- a long enough period of time to represent what a long-term simulation of the tides would be. So like, for example, the reason why NOAA, the National Oceanic and Atmospheric Administration, collected tide data at Fort Point during that time period was so that they could then do an analysis on that and use that analysis to predict tides any time in the past, any time in the future. And so that -- that -- that one month long simulation is sufficient to give you a representation of what those tidal currents are doing. And what we saw from that simulation is that it -- when you -- when you release particles that are sort of scattered throughout the bay they tend to take about two weeks until they move, so if you saw that animation I was showing that had the different colored dots floating around, if you look for about two weeks of that simulation and you say you picked -- you tracked a couple of the particles and you watch them with your eyes they were in Belfast Bay, about two weeks later they're out of Belfast Bay and there is new ones that have come in from up the river or from the other side of Islesboro or there may be some of them that even

circulated up from on the west side of Islesboro. So that was able to sort of answer that question that you've got about this two week time frame and so then if you look at what the impact is on the concentration in the area, after -- after two weeks of a continuous release, you have a good representation of what the long-term impact is going to be and that was kind of the first slide that I talked about that showed a very small light blue area and so that was, you know, and with looking at nitrogen, because in this case nitrogen is really the thing we're most concerned about. TSS we're not so concerned about because it's actually lower than what's in the bay now.

So that -- so I guess to answer your question that impact area is very small where you would see that elevated nitrogen concentration and it wasn't anywhere near where some of the sensitive population of eel grass were that we had. So I hope that answers your...

AUDIENCE MEMBER: (Audra McTague.) Thanks.

MS. TOURANGEAU: I am going to say I see we still have quite a long line. I just want to flag for folks that we're getting -- we've got 45 minutes left for the room, so if you are kind of not getting

to your question quickly, can you please try to. And I apologize, we are just running out of time a little bit.

AUDIENCE MEMBER: Yeah, my name is James Merkel. I live in Belfast. And for full disclosure, I am running for city council, Ward 5, a write-in candidate. And what really concerns me is the lack of transparency and public engagement. I know this is the fourth information meeting where we're allowed to ask questions and you're the expert. And I used to be in your shoes as a former marketer of military hardware and I had all of the answers and the people asking me didn't and so this is a very hard scenario, but we were begging, this whole community, for an engagement and this is still you're the expert and we're asking questions, so I'll participate in that.

But several questions, I want to start with, again, on the currents. Now, I'm a sailor, so I'm out there quite a bit. On an -- I'm usually running back into the harbor with the tailwind, you know, out of south, that's normal. And I know you left this -- the wind out, but it's quite significant and Wejisue's (phonetic) report from 1999 says the currents out in that bay are really affected by salinity and that's from the Penobscot. There is a

longshore current coming down the whole coast and it's also these other currents that wrap around Islesboro and it's very complex and it's even dependent on the wind direction, so I see that plume coming right into the -- past the park of the city, past the boathouse right into the harbor. You know, your ping pong balls are kind of showing it with the wind forcing that, which you didn't study. That's a quite common wind. And on the outgoing tide it's going to go right past Bayside and Kelly's Cove and these are beaches that people enjoy.

Now, Bayside has 1.6 pounds of nitrogen. You're talking about 1600, so that's what, my math, a thousand times more than Bayside Sewer. And Belfast City has 108 pounds of nitrogen versus your 1600, so this is like Belfast having a population of 98,000 people. It's like Portland putting their waste stream into, you know, equivalent to Belfast city's waste stream into our -- it's not a deep ocean current. I've heard Erik say it in three -- in two meetings so far that you're going for deep ocean currents. This is a deep estuary. It's a deep estuary where you are. And I saw your ping pong balls and I see your numbers, but I'm still saying would these citizens be sitting down and nodding

along because you can present data in very many different ways, but to putting 10 to 15 times more -- doubling the -- 15 times more sewage from Belfast Bay into -- and my children swim in those beaches, so like what guarantee do we have that the beaches aren't becoming horrible? Like, I mean, I don't know if there was -- if there was 15 sewers like just put into the Belfast Bay right in this estuary, I don't think I'd ask my boy to swim there. I think we'd go somewhere else, you know.

I mean, there is a lot of ways to present data, but this is another way to look at it and I'm just not clear. I need to have a gut feeling. I am a scientist too, but was looking at 1.6 from Bayside versus 1600 and I'm looking at 1600 versus 108 in nitrogen and we already have a closure. Our bays are closed for shellfish, toxic algae bloom, biotoxin. It's currently closed. And, you know, you say dilution is your solution to pollution and I teach sustainability at a university and we've been teaching that for 30 or 40 years. Like you say, well, we have the water so we can use it, but we at home turn the faucet off when we brush our teeth and when we do dishes and you're saying, well, it doesn't matter. So I just don't get this that it doesn't

matter that you're adding more to an already collapsed system. You know, you're saying, well, it's small, but it's more to an already collapsed system, so I don't get it.

MS. RANSOM: So I'm not a hundred percent sure of the question in there.

AUDIENCE MEMBER: (James Merkel.) Well, the question is how -- what guarantee when you're, you know, 10 to 15 Belfast city sewers and, you know, what happens if the beaches are smelly?

MS. RANSOM: So --

AUDIENCE MEMBER: (James Merkel.) You know, what -- what...

MS. RANSOM: -- the amount of nitrogen that currently is going in from other sources, the amount that --

AUDIENCE MEMBER: (James Merkel.) I heard you, yeah.

MS. RANSOM: -- is less than 1 percent is -- of that point source discharge, that 4.3 percent is going to go up by about three-quarters of a percent with this discharge. That's a pretty small amount. And when you look at the fact that the bay contains trillions of gallons of water --

AUDIENCE MEMBER: (James Merkel.) But what

happens if it's smelly at the beach, you know, I want to know. And, for example, like --

MS. RANSOM: Jim, I don't -- honestly, I don't think there is going to be any problems --

AUDIENCE MEMBER: (James Merkel.) You don't think so, right? Right.

MS. RANSOM: -- at the beach.

AUDIENCE MEMBER: (James Merkel.) No, I understand you don't think so. And then just the last question is Moulton Bay, Port Moulton Bay --

MR. DILL: I just wanted to respond to your question quickly.

AUDIENCE MEMBER: (James Merkel.) Yeah.

MR. DILL: Municipal sewage is much, much different than the water that's being proposed to be discharged here, so when you're talking about comparing the sewer discharge from a municipal sewage system, municipal wastewater treatment plant, you're not comparing apples to oranges.

AUDIENCE MEMBER: (James Merkel.) Right.

MR. DILL: And when you're talking about closures of shellfish bay -- shellfish areas and what drives largely the wastewater treatment discharge is bacteria concentrations, not nitrogen. And so that's the thing that you're concerned about at the beach

when it comes to a municipal sewer discharge, so it's not an apples to oranges comparison.

AUDIENCE MEMBER: (James Merkel.) No.

MR. DILL: I just wanted to make that clear.

AUDIENCE MEMBER: (James Merkel.) Sure. And the other question I have is about the smell and the pheromones and kairomones that are in that water. Like Moulton Bay recently did a study in Nova Scotia finding 56 percent decrease in bearing lobster -- lobsters bearing eggs and 40 percent reduction in regular lobsters because they're sense field -- they find their bait by antennas. They have to smell their bait and if your whole world smells like salmon you can't find a trap or you can't even find the food for yourself to eat, so this Moulton Bay study was 11 years and it's quite conclusive. And I don't know if you have read it. They give -- they say the things that really affect it are sulfides and ammonium, toxic and -- and they have behavioral effects on adults and other lobsters at various stages.

MS. RANSOM: Jim, remember the -- among the numbers from this facility are .003 --

AUDIENCE MEMBER: (James Merkel.) Right. I saw that, but --

MS. RANSOM: -- so that's pretty low.

AUDIENCE MEMBER: (James Merkel.) -- but how about the sulfides? But what about the sulfides?

MS. RANSOM: Hydrogen sulfide.

AUDIENCE MEMBER: (James Merkel.) Yeah.

MR. HEIM: I think -- I am not familiar with that particular study, but this is not a sea pen operation.

AUDIENCE MEMBER: (James Merkel.) Oh, I know very clearly, but the plume is going to have odor of salmon. I mean, it's going to smell of salmon. It's going to have that odor.

MR. HEIM: We have no odor in our farms.

AUDIENCE MEMBER: (James Merkel.) It's going to have --

MR. HEIM: This water is clean.

AUDIENCE MEMBER: (James Merkel.) What about -- can it -- are the pheromones taken out, kairomones?

MR. HEIM: Again, if you take --

AUDIENCE MEMBER: (James Merkel.) I know what a .4 micron is is what you're saying, right?

MR. HEIM: Yeah, exactly. So if you -- if you have taken the perspective that this is going into trillions and trillions of gallons in a bay, it's like taking a couple drops of water in a bucket.

That's about where we are, okay. So I've been along the whole coastline in Norway, I never really detected any smell outside of these facilities. The only thing that you need to be concerned about is how you handle your sludge waste because if you extract and dispose of it here it will start smelling, so that's why you need to contain it and make sure it's not exposed to oxygen. I have never walked along any land-based facility where there is a strong smell coming from the ocean.

AUDIENCE MEMBER: (James Merkel.) I guess what I would like to see too though if you would study or show some peer study that would look at the plume and its affect on lobster harvest.

MR. HEIM: Okay. Well, we look at the receptors of the population.

MS. RANSOM: Actually, I can take a little bit of that question on lobster and I think that's something that's near and dear to every Mainer. One of the primary things from a discharge that can have a strong impact on lobster growth is actually your dissolved oxygen. The lobsters are quite sensitive particularly in their juvenile stage to the DO levels. And so at a DO level, for example, of 2 1/2 milligrams per liter, the juveniles show a 30 percent

reduction in their growth. And adults are sensitive too, you know, you start getting up to, you know, 3 1/2 milligrams per liter and even adults show, you know, some distress. The discharge from Nordic's facility is going to be at 4 1/2 give or take, if I'm not mistaken, and that level is actually a level that's considered safe for marine life, so that it's not a level that you would expect to see an impact to lobsters. But the primary -- I mean, obviously there is a variety of different things. If there were high TSS the lobsters are going to be sensitive to that too, but really here out of the discharge numbers that we're looking at from this facility the primary thing that we'd be focused on for the lobsters is the DO and that is one of the things that's -- there is a number of studies I could share with you on that.

AUDIENCE MEMBER: (James Merkel.) Right. And the odor plume is what they really seem to single out in the Moulton Bay study was the odor plume, it affects their antennae and their ability to find food because their whole world smells like salmon. And maybe you don't smell it up above, but it could be down in the waterfall, that smell.

MR. HEIM: What's the case example this is based on?

AUDIENCE MEMBER: (James Merkel.) Pardon?
MR. HEIM: What is the case example that is based on?
AUDIENCE MEMBER: (James Merkel.) Port Moulton Bay. It's an 11 year study. It's near pens, but pen is a, you know, it's putting out the salmon smell, you know, your pipe is going to put out a salmon smell.
MR. HEIM: What is -- what's going to smell is your -- basically your waste coming from the farm. Your feces, feed particles, wasted feed coming out, that's what really smells and that's not going into the bay here.
AUDIENCE MEMBER: (James Merkel.) Right. The last time I cooked salmon and I washed my hands 20 times and they still smelled like salmon.
MR. HEIM: Well, if you open up the fish --
AUDIENCE MEMBER: (James Merkel.) I was swimming in -- I was camping in grizzly bear territory in DC --
MR. HEIM: Yeah.
AUDIENCE MEMBER: (James Merkel.) -- and I washed them 20 times before I went to bed that night, I still smelled like salmon.
MR. HEIM: Certainly if you open up a salmon

it will smell like fish, but --
AUDIENCE MEMBER: (James Merkel.) And your hands will -- and the smell is -- that's what's affecting the lobsters, so I just really urge you to look at that and maybe answer it. I'll -- I have 76 questions, but I'll give them to you in writing.
MR. HEIM: That's fine.
AUDIENCE MEMBER: Good evening. I'm Ellie Daniels and I live in Belfast and I too have a disclosure that I am running as a write-in for Ward 1 on the Belfast City Council. I admit I'm really disappointed not to hear more about feed tonight because everything that I try to research about what the salmon are going to be fed tells me that it makes a very big difference in what gets out in the effluent. So I guess you have a resident expert here.
MR. DEMOS: I'm not an expert. I'm a representative for Skretting, it's a feed --
AUDIENCE MEMBER: We can't hear you.
MR. DEMOS: Okay. I am a representative for Skretting Global Feed Company. I live in Newport. I've sailed Penobscot Bay for 38 years. I've protested the tanks in Searsport, so I'm passionate about the bay. As far as fish feed is concerned

allow me to read the statement because I'm not an expert, but we have experts, we have PhDs and so forth.
AUDIENCE MEMBER: We can't hear you.
AUDIENCE MEMBER: Hold the mic up.
MR. DEMOS: We screen for pesticides and heavy metals. We have never added growth hormones, sex hormones, nor do we use raw fish as an ingredient. We don't use antibiotics to our non-medicated feed. We are USDA compliant, FDA registered and have all the third-party certifications. Our feed meets all of the requirements around the globe including the European Union. All our ingredients used in the manufacturing of Skretting feeds are approved by the American Feed Control of Fishes and Canadian Feed Inspection Agency. Our feed plants are regularly inspected by the Canadian Feed Inspection Agency and the FDA. Our plants are ISO 9001 GMP, BAP is best aquaculture practices, HACCP, I don't know what that stands for but it's one of our certifications. We have a global audit team, which is a part of the supplier approval program. Their role is to visit the suppliers and ensure that they're complying with the food safety requirements. Testing for contaminants are also an

integral part of the process. We reject any raw materials that don't comply with the standards. I have a quality assurance report if anybody is interested and if there are any questions, please.
AUDIENCE MEMBER: (Ellie Daniels.) Oh, I have questions. You're telling me about your certifications and I do appreciate that, but what is in the feed? What are the salmon going to be fed specifically?
MR. DEMOS: Well, there is fish meal --
AUDIENCE MEMBER: (Ellie Daniels.) Oh.
MR. DEMOS: -- there is fish oil, but here is the thing, it depends on the feed.
AUDIENCE MEMBER: (Ellie Daniels.) That's what we want to know.
AUDIENCE MEMBER: We need you to tell us.
AUDIENCE MEMBER: (Ellie Daniels.) Erik, can you answer what specifically your fish are going to be fed?
MR. DEMOS: It depends on the type of feed you're feeding. We have organic feed. We have low phosphorous feed. We have all kinds of different feed, so.
AUDIENCE MEMBER: (Ellie Daniels.) I would specifically like to know specifically what Nordic

Aquafarms is going to feed their fish.
MR. HEIM: Okay. I can speak about that. So we're not even close to making a final feed selection here. Right now, we're focused on the --
AUDIENCE MEMBER: Hold the microphone up.
MR. HEIM: Okay. We're not even close to making a final feed decision in the U.S. We are just making that in Norway, it would start up in two months over there. So generally what you will see in the feed, it's a growing amount of vegetable proteins --
AUDIENCE MEMBER: (Ellie Daniels.) What kind of vegetables, please?
MR. HEIM: There could be a whole range of vegetable proteins involved in their feed.
AUDIENCE MEMBER: (Ellie Daniels.) Are there soy proteins?
MR. HEIM: There can be soy. There are substitutes for soy. Any time you look at these proteins you want to be looking at where they're sourced from, how sustainable are they, for example, soy bean is something I'm also looking to reduce because among other things you look at how this is grown in Brazil with deforestation, not a big fan. You want to look at who has produced it, where it is

produced to make sure that this is a safe, good product. Same with protein as other sources of vegetable protein as well.
AUDIENCE MEMBER: Like corn? Is there corn in the feed?
MR. HEIM: There can be, yes. Again, you always look at the sourcing of these things.
AUDIENCE MEMBER: (Ellie Daniels.) Are there animal byproducts in the feed?
MR. HEIM: That is used in some feeds, yes, it depends.
AUDIENCE MEMBER: (Ellie Daniels.) And how are animal byproducts certified in feed?
MR. HEIM: That is an issue we will be looking into in the U.S. Our concern is the sourcing of it and to be sure that is a safe, good sourcing. For example, we know that in the U.S. antibiotics is used in animal feeds in some cases. This is not something we see in Europe, so obviously that's one thing we're going to be looking at that we want to make sure that every source we have is antibiotics free in terms of that.
AUDIENCE MEMBER: (Ellie Daniels.) And where will you source your fish meal?
MR. HEIM: That's up to a discussion with

the feed company in the end to see what their sourcing practice is. There are many practices regarding that. And then there is also alternatives coming into the business now in terms of algae and also insect proteins. Many good substitutes are coming in.
AUDIENCE MEMBER: (Ellie Daniels.) Well, they're just coming and I understand --
MR. HEIM: They are coming in.
AUDIENCE MEMBER: (Ellie Daniels.) -- that there is no quantity at all that has been done yet.
MR. HEIM: No, but we're not buying feed until two or three years from now, right, so in the next couple of years --
AUDIENCE MEMBER: (Ellie Daniels.) Yeah. Okay.
MR. HEIM: -- you're going to see a lot of developments in this industry. And the reason why is that this industry needs to meet the challenge of an extremely fast growing global aquaculture industry because that's where growth in seafood is coming from in the next decades and their challenge is to meet that industries needs in a sustainable matter, so there is an enormous amount of R&D going on in this industry right now.

AUDIENCE MEMBER: (Ellie Daniels.) Yes, it's very profitable. I can see that from --
MR. HEIM: Actually, feed is a fairly low margin business. You have powerful buyers. They are pressing the feed companies on the margins, so it's not as profitable as you might think to be honest, so. Yeah.
MS. TOURANGEAU: We are getting -- I appreciate, Miss Daniels, that you have questions about the specifics about the feed and I appreciate --
AUDIENCE MEMBER: (Ellie Daniels.) Well, I appreciate the answers.
MS. TOURANGEAU: -- and I'm hoping that we can move to questions about the discharges. We're running short on time.
AUDIENCE MEMBER: (Ellie Daniels.) I do have questions about the discharge. Specifically, how big is the diameter of this effluent pipe and will there be one effluent pipe or two effluent pipes and how many water intake pipes?
MS. TOURANGEAU: So I'm going to preface letting you answer by saying that this permit is not for the construction of the intake and the outfall. That will be covered as I addressed in the first part

in the other permits that are issued and you can answer it really quickly, but.

MS. RANSOM: Ellie, I can give you a brief discussion on that. As Joanna mentioned, we are going to be covering that in more detail when we get to the Army Corps permitting and there will be a lot more detail provided and some of that is still ongoing engineering. But one of the things that CORMIX modeling does look at is what are the best ways for that pipe end to appear so that the dilution you receive is the best possible that you can and so we're looking at anywhere from a 30 to 36 inch diameter pipe at the moment and there could be multiple ports particularly in the beginning when the flows are lower and there could also be diffusers involved. And all of those things will be looked at and engineered over the next few months to make sure that by the time we get to the Army Corps public meeting we have more answers for you.

AUDIENCE MEMBER: (Ellie Daniels.) Okay. I do want to know because it seems to be a moving target and I'm interested in the plume related to discharge and ports, is this the same as baffles, meaning that along the termination of the pipe you have multiple places that the effluent --

MS. RANSOM: And we're about to get out of my realm of engineering.

AUDIENCE MEMBER: (Ellie Daniels.) Okay.

MS. RANSOM: But there are things, for example, like a duck bill where you can have something that opens when the flow reaches a certain level --

AUDIENCE MEMBER: (Ellie Daniels.) Exceeds a certain --

MS. RANSOM: -- and then comes back down, yes.

AUDIENCE MEMBER: (Ellie Daniels.) Okay. Well, early on in this process we were told that the pipe would be a mile and a half out in the bay and then we heard a mile and now we're hearing about it in meters. And so I had used my trusty iPhone, same thing with the kilos to pounds. I really think that an American permit might put American measures on these things so that we could understand them more. But I did use my phone, so I see now that you're talking about .62 miles out and my neighbor who lives down there on the shore talks about a half a mile of flats at low -- low tide. It's a very shallow bay out there, so we're not very far out.

MS. RANSOM: I can tell you that this refers

to at mean low water, so the flats don't count essentially in our distance calculation. So if it's dry to some degree that doesn't -- so when we're talking about depths, for example, that 35 foot depth at the pipe outfall is at mean low water. So, yes, it's counting in our distance, but it's not counting in our depth distance. So the idea is we've looked at over time with the modeling different scenarios for what happens if you put the pipe at 500 meters, what happens if you put the pipe at 1,000 meters, what happens if you put the pipe out at 1500 meters and we've optimized through the modeling scenarios, you know, where do you see change occur and how do we make sure that that discharge isn't coming right back into the bay and the reason you don't have the pipe at, you know, 20 meters is because you're going to get better effects by going further out, but you also don't want to go so far out that you're, you know, getting to the other side of the bay. So part of what we've done -- why the number of changes and why we have a draft application process is so that we can understand the science before we settle on a number and obviously in early meetings we hadn't done the engineering yet and so we're working on it.

AUDIENCE MEMBER: (Ellie Daniels.) I have

one last question that I don't believe anybody has addressed.

MS. TOURANGEAU: I --

AUDIENCE MEMBER: (Ellie Daniels.) Excuse me, other people have been able to get to the end of their --

MS. TOURANGEAU: I hear you and I am going to interrupt you just briefly to say that right now for the last two at about 15 minutes per person. We have seven people in line and about 20 minutes left, so I'm going to ask people to keep it short and apologize to people that are at the end of the line.

AUDIENCE MEMBER: (Ellie Daniels.) We all are aware that there is a second large salmon farm that is applying -- going through its discharge permit right now up in Bucksport and I am wondering if you know how the DEP will be handling the fact that two large facilities will be discharging into the bay and if there is some kind of a plan for a cumulative effect study related to two facilities.

MS. TOURANGEAU: It's not truly relevant to our permit, but I do -- I am aware that the DEP has issued a draft permit for that project that has been circulated, so that I'm sure when our permit comes in that that will be taken into consideration.

AUDIENCE MEMBER: (Ellie Daniels.) Thank you. Just a procedural question. Someone had to submit their email in order to get a scientific study. We all submitted emails here, will we all receive scientific responses to those questions?

MS. TOURANGEAU: We -- like I said at the beginning of the meeting, I am going to pull the questions on the permitting criteria out and there will be narrative responses if they're not addressed in the transcript.

AUDIENCE MEMBER: (Ellie Daniels.) Thank you.

AUDIENCE MEMBER: Good evening. My name is Don Perkins. I run the Gulf of Maine Research Institute down in Portland and I would note I've done that for 24 years now. I have been watching the evolution of the aquaculture industry in Maine since the late 1980s with the first salmon farms. I was a co-founder of Friends of Casco Bay and so I have a deep interest in water quality and we're actively involved in understanding and stewarding the ecosystem along the coast of Maine as well as supporting the growth of a sustainable seafood industry. So I've been watching this. I've been watching the evolution of the RAS industry for the

past few years. We at GMRI from an economic point of view are interested in aquaculture as a diversification opportunity along this coast. And I came up here tonight -- I'm actually on vacation, but I came up here tonight having listened to this from a distance to just share an observation from the outside.

Number one, how you all decide as community to deal with this project is -- that's a local question and you have a healthy political process here to do that. I would note from a distance and as a party that has no dog in this fight, no financial relationship, no business relationship with Nordic, that this -- this is a state-of-the-art project. It's been engineered thoughtfully. I had an opportunity to grill them about their environmental impacts. The concentrations of nutrients going into the bay are small. The number of gallons is a big number, but it's trivial in the context of the volume of Belfast Bay. They are engineering -- and I've been in touch -- I've tracked this through the marine construction industry, friends in Norway who are very familiar with the evolution of RAS in Norway. Objectively, this is the best practice project. It's being introduced into a state that's known nationally

for having best practice --

AUDIENCE MEMBER: What's your question?

AUDIENCE MEMBER: Yeah, what's your question?

AUDIENCE MEMBER: (Don Perkins.) I'm going to get to it. I'm going to get to it. -- best practice regulatory practices. And so I think, you know, time will bear out examining this, but the engineering side has been very well done. I think to me the big risk question and where my question goes is on the operational side. Once you've built a state-of-the-art facility then it's a matter of how well you operate it. And I'm interested, Erik, in how you think about, you know, who you're going to hire, what kind of training and what kind of risk management you're going to do once it's built. Thank you.

MS. TOURANGEAU: Thank you.

MR. HEIM: And I totally agree. This kind of operation that we're looking at --

AUDIENCE MEMBER: It's not related to effluent, so why can he ask that question? It's not related to effluence. You just shut Ellie down.

MR. HEIM: I'll answer it briefly because it also does relate to your discharge. So, yes,

recruiting and training and people is a really important part of operations discipline. Operations discipline also goes into your practice and how you develop your protocols and your practices related to monitoring and following-up and making your discharge structure. So all of these things are linked together. So, for example, in terms of the water treatment plant, we have a CTO, David, down here, who has many years of experience. He will be one of the key people overseeing also the -- all of the wastewater plants and that experience is highly important and it's important to have people with discipline and competence to operate these things. So that's the short answer and I could talk about a lot more about the production side, but I'm not going to do that right now. But, yes, it is true, operations excellence is extremely important.

AUDIENCE MEMBER: Good evening. My name is Paul Dean and I live in Belfast. You may not be able to answer these questions. I have three. The first one, I don't know if the effluent line will be pressurized or not. And I heard earlier tonight, I thought, it's quite noisy in here, that the testing would be done quarterly on the effluent that comes out of it and then I heard about the possibility of

the public sampling out further on the line. If that line is actually pressurized, you should be able to bring sample points up from it and sample on a more regular basis. I'm speaking tonight more that I can be on record with the DEP that I would encourage the testing be done on a more regular basis so that, you know, things that -- we'll know what will actually go out in the bay. I haven't heard anything about pH, but that would be another one.

That puts into effect that this is a -- with the DEP I have to mention about catastrophic tank failure. If you build this site will there be a berm around it to be able to take the waters from one or two tanks actually breaking down and what the emergency procedure would be for something like that?

Last and not least, but on this line that goes out, if it plugs, and I'm hearing things moving and stuff in the line, I'm hoping that you're planning to develop an emergency procedure because you have fish that would be dying shortly in the tanks without that outflow and what would you do in that emergency? And thank you very much.

MS. TOURANGEAU: Sir, I am not sure that I captured your last question about the fish dying in the tanks. Were you saying in the --

AUDIENCE MEMBER: (Don Perkins.) If the outflow of the, you know, the effluent line stops, plugs up.

MS. TOURANGEAU: Okay.

AUDIENCE MEMBER: (Don Perkins.) Possibility. Everything is a possibility at times and we can go from there.

MS. RANSOM: I can take a crack at some of those. Some of them will be partial answers and we'll hopefully get to some more detailed answers for you. Right at the moment I think the design is a little bit unclear still as to whether or not we're having a gravity flow or a pumped flow down the pipe and so I hope you'll come and repeat that question when we're doing our Army Corps permitting.

As far as the frequency of monitoring goes, there are certain parameters that get monitored in the plant daily, probably hourly, and that's ongoing throughout. Obviously this is -- these are living creatures that need the water quality to stay good within the plants and so some of that monitoring is conducted and logged with equipment, not manually, so that we can take those readings more frequently. But in addition, the permits are usually issued with monthly, weekly, and daily maximum values that you

need to meet so that the monitoring is actually conducted much more frequently than just monthly.

And as far as the public sampling piece goes, I think we're still working on developing what that might look like in terms of, you know, who might be working and participating on that and what that might involve and there certainly are both groups and individuals that expressed interest in joining that in some fashion.

As far as the questions about the tank collapse procedures and clogs in the effluent line, that actually somewhat gets back to Don's question previously. A lot of what we are -- we're all, you know, concerned about is risk management and when there is human error that's when we have the most risk and I certainly see this in my business as an environmental consultant as well. I send somebody into the field and they are more likely to get injured if they aren't following appropriate procedures. So it does in a lot of ways fall back to do you have appropriate procedures in place for these emergency situations and one of the things that actually is frequently requested in a draft permit is to see within a given time period from the issuance of that permit your plans for dealing with those

emergencies and so those are things that will be developed. The facility will have best management practices that their employees will be trained to follow and those will include things like cleaning pipes so that we hopefully don't have a situation that requires an emergency because the pipe is clogged. So, yeah, there is going to be a procedure for dealing with those kinds of emergency situations.

AUDIENCE MEMBER: Hi. My name is Shay Conover. I'm from Islesboro. And I agree, aquaculture done well is going to be an important part of the future of Maine's coastal economy. My husband and I are farm managers on the aquaculture lease site that was shown just south of the map of the discharge site and we also farm muscles on a site a couple miles away on Islesboro.

I have two questions. The first is just a clarifying question wondering if the water quality models that you have done, are those based on Phase 1 or Phase 2 discharge?

MS. TOURANGEAU: Both. I can answer that one.

AUDIENCE MEMBER: (Shay Conover.) Thank you. I thought I just missed that and I wanted to clarify.

And then the second, I guess, is our largest concern is Penobscot Bay for us is great in growing shellfish because while it -- because of it it is great, clean water, a lot of the reasons why you want to come here. We also are very fortunate in Penobscot Bay in that where there are often particularly in the summertime large amounts of time where we're -- folks are closed and other parts of the state for algal blooms, particularly red tide, and more Downeast in domoic acid. Penobscot Bay really has not had any of those closures this season and at the same time, you know, the coast of Maine has very clean water but potentially different mixes of nitrogen and the phosphorous and water temperatures are all very complex. But I'm interested in how, you know, what you are bringing into the water and how that might, you know, even slightly change our mix and potentially increase the amount of time where other farmers nearby may be closed to harvest is a concern.

MS. RANSOM: Hi. I'll try to take that one. So one of, you know, as we went through the presentation, obviously some of the critical factors to whether you develop things like algal blooms are things like your nitrogen and phosphorous discharge.

The -- the facility is taking denitrification seriously because obviously they want to be a good steward of this water and we fully believe that the discharge is not going to have a significant change to the nitrogen values that you have in the bay now, that the facility is going to be able to monitor their discharge as they start up. It's not like -- so we've shown numbers tonight for the full facility, so all that modeling and all those numbers that we showed you were for 33,000 metric tons at full capacity of this facility, but the facility is not going to get there over night. There is not going to be 33,000 metric tons of fish in the first year. It takes a long time to grow a salmon and it's going to take a long time to build this facility. So there is going to be many years of monitoring data that we'll have accumulated to see how they're doing and in the first months of operation they're going to have a small discharge with a small amount of nitrogen coming down the pipe and we're going to see how the bay responds to that. And as they grow, we'll continue to add to that dataset, so by the time they get to a full build-out situation we're going to have a pretty good understanding how that impacts the bay and whether you're seeing any impacts down in your

portion of the bay. And so we've tried with the information we have to place this pipe in a way that's going to not cause an impact to the bay, but we're also going to have a lot of time over the next few years to show that we're right and make sure that, you know, we don't get to a full phase facility without understanding the potential impacts of where it goes.

AUDIENCE MEMBER: (Shay Conover.) Right. I mean, I think local farmers don't have the economic ability to run that kind of experiment. I guess the other piece is just -- that might be helpful is to have some kind of comparative table to understand -- it was helpful to get the background levels in Penobscot Bay, I think that would be helpful to have that compared to other regions where there are aquaculture farms and how it would be -- we'd be able to more easily compare kind of environmental factors that other farmers are dealing with would be very helpful.

MS. RANSOM: Just real quick on that is one of the things that there is a lot of information for is some of the more closed estuaries, so you'll find, for example, in Great Bay at the Maine/New Hampshire border there is a fair bit of shellfish farming there

and there are a number of studies for that area. One of the things that's better about Penobscot, I guess, would be to say it's a bit more open. There is a bit more circulation happening and so your numbers up here tend to be better than what you might find in some of those other situations.

MR. NOYES: I just had one quick follow-up question. What are you growing in that lease site? Are you growing sugar kelp on your lease site, that one that was plotted?

AUDIENCE MEMBER: (Shay Conover.) Sorry. Currently --

MR. NOYES: Sugar kelp and muscles.

AUDIENCE MEMBER: (Shay Conover.) Currently, it's blue muscles, but it's permitted to grow sugar kelp as well as blue muscles.

MR. NOYES: Okay. And sugar kelp would be removing some of those nutrients we discussed?

AUDIENCE MEMBER: (Shay Conover.) Yes.

MR. NOYES: Okay. Thank you.

MS. TOURANGEAU: I'm going to just ask too if your information is on the sign-in sheet we would love to connect with you about monitoring.

AUDIENCE MEMBER: (Shay Conover.) Yup. That would be great.

MS. TOURANGEAU: Thank you.
AUDIENCE MEMBER: Hi. My name is Amy Green and I actually live in Monroe. I would love to live in Belfast where you have multiple job opportunities ready, but I haven't actually found affordable housing here. So the rezoning of your residential land into this massive industrial project was a shock for me to find out about.
And I did want to talk about the effluent from the run-off that would happen when you replaced 40 acres of woodlands with 18 football fields of impervious surface, pavement, rooftop, so that's a lot of run-off. Projections for our area of rainfall -- and I know that there are engineering practices for huge industrial areas. I don't live in a huge industrial area on purpose. I know this is a very -- it's almost as though folks are speaking like you're going to be exploited anyway, isn't it nice that it's so green and proper.
MS. TOURANGEAU: So we are looking for questions on the discharge.
AUDIENCE MEMBER: (Amy Green.) My question is how are you treating the run-off that will be gathered from rainfall off of here, that is my question.

MS. TOURANGEAU: So that will be addressed in the site location of the Development Act Permit and the Natural Protection Act permits, which are still forthcoming. Right now, tonight, we're talking about the discharge from the wastewater treatment facility at the project.
AUDIENCE MEMBER: (Amy Green.) I was interpreting that as discharge as well.
MS. TOURANGEAU: The storm water doesn't go in there.
AUDIENCE MEMBER: (Amy Green.) It doesn't. Okay. Thank you.
MS. TOURANGEAU: Yup.
AUDIENCE MEMBER: Hi. My name is Joelle Gaseidnes and I live in Belfast.
THE REPORTER: Could you spell your last name for me, please?
AUDIENCE MEMBER: (Joelle Gaseidnes.) Sure. G-A-S-E-I-D-N-E-S.
THE REPORTER: Thank you.
AUDIENCE MEMBER: (Joelle Gaseidnes.) My question really is only about climate change and the warming of the Gulf of Maine, which is the second most quickly warming body of water on the planet. And I'm curious if you could just speak a little bit

to what extent that's being factored into planning if the project goes well you'll be here 30, 40 years from now and the water will be a very different temperature, so that's my question.
MR. HEIM: Is your question the impact for the production, is that what you're thinking or?
AUDIENCE MEMBER: (Joelle Gaseidnes.) I just want to hear more about production as well as the models that you discussed regarding effluent using today's temperatures and today's scenarios --
MR. HEIM: Yup.
AUDIENCE MEMBER: (Joelle Gaseidnes.) -- but what does that look like when the water is warmer?
MR. HEIM: Exactly. So this is, I think, it's not directly related to discharge, but it's sort of interrelated. This is a concern I have for this industry when you look at so much of the seafood production in the world being dependent on the ocean conditions we have today. So one of the benefits of this production is that we have temperature control. We can -- we can adjust pH, we can adjust the oxygen levels in the water, all of these factors that can be influenced by climate change we can adjust and that's one of the big benefits of this production. Much

more difficult to do if you are in the ocean. And that's what scares me, you know, when you look at coastlines change in temperatures and all of these conditions, new species coming in, current species in some cases disappearing. It's scary. So our contribution to this in terms of our surroundings is to minimize any contribution and impact to that process and I think the whole industry has a common responsibility. As of today, I am not familiar with anyone who has gone as far as us to do that, but I am sure this industry will be moving in that direction in the years to come because it's necessary.
AUDIENCE MEMBER: (Joelle Gaseidnes.) Yeah, I think my -- I mean, I appreciate that. My question was more specifically regarding you -- what is coming out in the effluent, coming into the bay --
MR. HEIM: Yup.
AUDIENCE MEMBER: (Joelle Gaseidnes.) -- it's assuming a certain temperature, it's assuming a certain mixing --
MR. HEIM: Yup.
AUDIENCE MEMBER: (Joelle Gaseidnes.) -- according to temperature and stratification according to temperature.
MR. HEIM: Yup.

AUDIENCE MEMBER: (Joelle Gaseidnes.) And as the bay warms does that stratification change? Does the way in which it mixes become more favorable or less favorable?

MR. HEIM: I think you can answer that, Nate.

MR. DILL: I think I have a very quick answer to this question. The modeling that we have done considers a full seasonal changes and the -- and actually the data that was collected that we've used or sort of the best dataset that we've used we've looked at data, you know, going all the way back into the '70s. But one of the most comprehensive datasets on stratification in the bay was from '70s and the climate has changed significantly since then I would think in terms of climate variables if you look at long-term average temperatures and things. What's actually -- what's actually important for the -- for the physical behavior of the discharge is what is the temperature now today and we have looked at a range of temperatures that go from right around 0 to degrees to probably around 60 degrees in term of the ambient temperature in that modeling. Those variations -- just the seasonal variations are much, much larger --

AUDIENCE MEMBER: (Joelle Graseidnes.) You're talking Celsius, right?

MR. DILL: No. No. Fahrenheit. I just --

AUDIENCE MEMBER: (Joelle Graseidnes.) No. Zero degrees?

MR. DILL: Yeah, the water gets pretty cold in the wintertime.

AUDIENCE MEMBER: (Joelle Graseidnes.) Okay.

MR. DILL: Yes, very cold.

AUDIENCE MEMBER: (Joelle Graseidnes.) Okay. Wow.

MR. DILL: And there --

AUDIENCE MEMBER: (Joelle Graseidnes.) Like below freezing?

MR. DILL: Yes. Yes. The surface -- the surface water of the bay gets --

AUDIENCE MEMBER: (Joelle Graseidnes.) Okay.

MR. DILL: -- down to freezing temperatures in the wintertime, yes.

AUDIENCE MEMBER: (Joelle Graseidnes.) All right.

MR. DILL: So, now, maybe not at the bottom, it might be warmer. You have -- you have a

reverse -- you have a reverse of temperatures in the summertime when you have very cold, maybe, I don't know, 30 degree water toward the bottom. We're not -- I'm sorry, I just mixed my Celsius and Fahrenheit.

AUDIENCE MEMBER: (Joelle Graseidnes.) Yeah.

MR. DILL: Yeah. Sorry. Around 30 --

AUDIENCE MEMBER: (Joelle Graseidnes.) You're using what my grandfather used to call a super cool thing.

MR. DILL: Around 30, yes, 30 to 60 degrees in terms of Fahrenheit. I was giving the low end of Celsius and the high end of Fahrenheit to give the full range. But anyway, the point that I'm trying to make is that those seasonal variations are much bigger than any variation that we're going to see in terms of long-term temperature. And what's actually really important for the physical behavior of the plume is what is the -- what is the current temperature of that season, not so much the average over the long-term 30 year period, so.

AUDIENCE MEMBER: (Joelle Graseidnes.) Thank you.

MS. TOURANGEAU: I'm going to thank all of

the people that have been coming along for managing their time so well. There is a gentleman who has to clean up after us who has stayed late because school closed early today and it's closed tomorrow, so he has given us some leeway. I want to use it as wisely as we possibly can, so please keep up the good work. Thank you.

AUDIENCE MEMBER: My name is Suzanne Stone. I live in Belfast. I haven't heard any studies about the dissolved organic carbon levels. I know that the high DOCs are causing dead spots in our ocean and I'm wondering if you've been studying those levels and how much are they coming out in the effluent and the discharge.

MS. RANSOM: Could you repeat that for me?

AUDIENCE MEMBER: (Suzanne Stone.) Yeah. I am asking about if your studies have been concerned with the dissolved organic carbon levels in the effluent as they're causing dead zones in our ocean.

MS. RANSOM: We have not specifically sampled for dissolved organ carbon levels. If you have specific studies and references that you'd like to provide with us, we'll be happy to look at that.

AUDIENCE MEMBER: (Suzanne Stone.) I was thinking they would be part of the samples that are

studied.
MS. RANSOM: Yeah, I'd very much like to -- if you could provide us with the studies, I'd very much like to see what exactly they are monitoring by what method and so forth so that perhaps if it seems like something we should be adding to the monitoring program we can consider that.
AUDIENCE MEMBER: (Suzanne Stone.) Thank you.
MS. RANSOM: So if you can provide that it would be great. Is your email contact information available?
AUDIENCE MEMBER: (Suzanne Stone.) I will write it down.
MS. RANSOM: Thank you.
AUDIENCE MEMBER: Hi. I'm Camille Giglio and I'm a resident of Thorndike.
THE REPORTER: Could you spell your last name for me, please?
AUDIENCE MEMBER: (Camille Giglio.) G-I-G-L-I-O.
THE REPORTER: Thank you.
AUDIENCE MEMBER: (Camille Giglio.) I would love to know what are your plans for filtering out -- thanks to Ellie we know that there is a potential for

corn and soy in the feeds for the salmon, which is a pretty known kind of thing. I would love to know your plans for filtering out GMOs from this feed and the plans as far as the effluent and what gets through the UV filtration system and the other filters you're using. So along with the GMOs there is known carcinogens in GMO feed and so I'd love to know your plans for filtering out those things from the water as well.
MR. HEIM: So in terms of GMOs they're not allowed in Europe, so we have no GMO issues where I come from and it's something we've become more familiar with here in the U.S. That's is a big discussion.
AUDIENCE MEMBER: (Camille Giglio.) Yup.
MR. HEIM: So we have had discussions with this with our feed companies.
MR. DEMOS: No GMOs.
MR. HEIM: There is no GMOs in the feed. We -- I mean, you can get feed with GMO for sure, but we are making a conscious choice in terms of the quality of the product to say away from ingredients with GMOs just to make that clear.
AUDIENCE MEMBER: (Camille Giglio.) Okay. Just from -- I'm sure you already know, but soy as a

crop there is no non-GMO soy that exists, so that's another factor to keep in mind when thinking of the feed. And I meant to ask this in my second part of the question is vaccine run-off from -- you ensured us that you're vaccinating all of the fish.
MR. HEIM: Yes.
AUDIENCE MEMBER: (Camille Giglio.) The potential of vaccines coming into the water and into our bay and water supply, what are the plans for filtering that out as well of the water?
MR. HEIM: Yeah. So vaccines are administered not in the tanks. They go through a vaccination process. Basically they're pumped and go slide through a vaccination machine, they give them a small needle and they go back in.
AUDIENCE MEMBER: (Camille Giglio.) Right. But their bodies are actually detoxing the vaccines into the water and if you're talking about hundreds of thousands of fish --
MR. HEIM: The benefits --
AUDIENCE MEMBER: (Camille Giglio.) -- it accumulates quite a bit.
MR. HEIM: Yeah. So the benefit typically -- we have a gentleman here who wants to say something.

MR. BRICKNELL: I have actually spent a lot of time developing fish vaccines. Every single fish that gets a vaccine, the salmon anyway, will be injected either by a machine or by hand and their bodies will process it, but what you're doing is you're taking a bacteria or virus is grown in a laboratory quite naturally and the whole organism is going in and you're tricking the immune system into thinking it's got an infection, it breaks it down just as it would any natural infection.
AUDIENCE MEMBER: (Camille Giglio.) Yeah.
MR. BRICKNELL: There will be none of that excreted from the fish into the water. It's all processed by it's macrophages and it's put into a tissue called the pronephros at the top of its kidney and in the spleen and it becomes part of the fishes immune system.
AUDIENCE MEMBER: (Camille Giglio.) Right. I know what a vaccine is. I -- I -- as far as I know, vaccines still come out of our bodies and they're in our water supply.
MR. BRICKNELL: No, it doesn't.
AUDIENCE MEMBER: (Camille Giglio.) Okay. Thank you.
AUDIENCE MEMBER: Yes, my name is Robin

Duffy, D-U-F-F-Y. I live in Belfast. I'm a homeowner and taxpayer here. I think one thing that would be great is you guys keep referencing a lot of studies, but you're not making those available to the mass public. So any presentation I've ever been to where studies are referred to they're always given at the end of a slide or at the end, so it would be great if you could actually provide us with those like on a website or on the city website, I'd really appreciate that.

MS. TOURANGEAU: Can I respond to that really quickly?

AUDIENCE MEMBER: (Robin Duffy.) Sure.

MS. TOURANGEAU: The reports that accompany the modeling, which I think is where you're hearing those studies, have the citations to the studies in them and those will be in the application when it's submitted.

AUDIENCE MEMBER: (Robin Duffy.) Okay. Great. Thank you. You spoke about the BOD levels and how much harm can come to the lobster population if it's high and you said that you're going to control for the level of DO, am I correct about that so far?

MS. RANSOM: Close. BOD and DO are

interrelated --

AUDIENCE MEMBER: (Robin Duffy.) Right.

MS. RANSOM: -- so it's a little confusing. The parameter I was speaking about with regard to the lobsters in particular was the DO. There are a number of studies about DO and lobster shell growth.

AUDIENCE MEMBER: (Robin Duffy.) Okay.

MS. RANSOM: And the -- the BOD number is more of a general indicator --

AUDIENCE MEMBER: (Robin Duffy.) Okay.

MS. RANSOM: -- for the health of the ecosystem.

AUDIENCE MEMBER: (Robin Duffy.) So the DO is more specific?

MS. RANSOM: Correct.

AUDIENCE MEMBER: (Robin Duffy.) Okay. So Erik said that like with flying there is always a risk for anything, correct? I wanted to know like let's say that there is a pipe failure because I think that may happen as we just saw recently in the Carolinas there were all these CAFOs with all the -- the pig overflow, I mean, things do happen, right. Hurricanes happen, all kinds of issues happen. If there is pipe failure and high levels of DO, do you reach our working waterfront where fishermen and

lobstermen, lobster people make their living and we have this community here, do we really want to take this risk? Do you really want our community to take the risk because I know you made a joke and said you'd be happy to get on the plane, you still fly, you take the risk. I don't think that our community would want to take that risk, so that's one question I had for you.

MR. HEIM: Yup. Okay. So it's more discussion of probabilities. That's what I'm trying to get at. So if you take, for example, BOD, this is reduced in two stages in the system --

AUDIENCE MEMBER: (Robin Duffy.) I think people can't hear you.

MR. HEIM: Okay. If you take a sample of BOD it's reduced in two stages in the system. First it's reduced in the tanks because we have filtration in the tank system also.

AUDIENCE MEMBER: (Robin Duffy.) Right.

MR. HEIM: And there is a secondary reduction in the wastewater treatment plant, so there is two stages of that. So what would happen if you get a pressure loss anywhere in the piping, you would drastically reduce the pumping right away, stop feeding the fish so you would reduce your water need

quickly in the system. So you would very quickly be able to reduce your water exchange in the system and that's how we would deal with a situation like that. And if you have a pressure loss you identify the application and you fix it. So if, for example, the discharge pipe had a pressure loss that would not result in more BOD because it's already been reduced in the facility. If we have a pipe failure for whatever reason on the site we will be in a situation where we would have to take out the feeding of that part of the system, reduce the water cycle right away and if we stop feeding we can actually shut down that pipe and repair it right away. That being said, these are industrial grade pipes, it takes a lot for them to truly fail on a larger scale, so. And we have a professional contractor here in Maine, Cianbro, who is also present who has a long, long experience in building piping systems. So you are likely in very good hands with Maine experience and also doing business. But you're right, everything like this is things we have to think through and plan for and also always think how do we avoid the situations in terms of how we design and how we build. It's an important part of the design process.

AUDIENCE MEMBER: (Robin Duffy.) Okay. I

had just a couple other questions. Are you planning on processing fish on site and, if so, do you intend to use the Belfast sewer system for disposing of processing fluids?

MR. HEIM: There is a separate treatment plant for fish processing.

AUDIENCE MEMBER: (Robin Duffy.) Okay.

MR. HEIM: So that comes before the wastewater treatment system.

AUDIENCE MEMBER: (Robin Duffy.) Okay.

MR. HEIM: So this is also part of the application, so everything we have from the processing plant goes to a separate treatment process and that is also -- that was before the wastewater treatment process.

AUDIENCE MEMBER: (Robin Duffy.) Okay. And then finally I --

MS. TOURANGEAU: Is it going to Belfast?

MR. HEIM: Hmm? No, it's not.

AUDIENCE MEMBER: What?

MR. HEIM: It's going through multiple treatment stations.

MS. TOURANGEAU: She asked if it was also going to Belfast and I asked Erik to answer that question.

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MR. HEIM: No, it's not going to Belfast.

AUDIENCE MEMBER: (Robin Duffy.) And just as a final comment, I just wanted to say I think any pollution into our waters is too much pollution.

AUDIENCE MEMBER: Hi. Bethany Allgrove. I live in Lincolnville. I'm really curious, how do you calculate discharge if you don't know what you're feeding the fish?

MR. HEIM: So the first step is to calculate the amount of feed you will use then we know this based upon so-called feed factor, how much -- how much feed we will use for every pound of salmon produced, so that helps us calculate the exact amount of feed we will use.

AUDIENCE MEMBER: Please hold the microphone closer.

MR. HEIM: Okay. And the next step in that process is to look at the typical feed profile that we would use and so what we've done there is to find interval of various nutrients in the feeds that are available in the market and we set the max values for the values in the feeds, that gives us a big interval to move inside of in terms of composing a final feed. And that's how you get to the figures you see here, which are the max discharge figures, not the average,

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the maximum. That gives a lot of room for us to play with the final feed composition at the end before, so it could considerably be that the final feed that we end up with will reduce this discharge quite a bit potentially.

AUDIENCE MEMBER: (Bethany Allgrove.) But you said things were still being developed for feed --

MR. HEIM: What?

AUDIENCE MEMBER: (Bethany Allgrove.) You said new feeds are being developed. If we're not going to know what we're feeding them until 2020, but you're submitting application data in 2018, what's the process for updating the permit and the public information on those updates?

MR. HEIM: I think you will see that producers can change their feeds over time. That's very common. That is partly because the feed industry is developing, new options become available. So for us it's a matter of saying conservative assumptions in terms of what we know are available feeds, that gives us room to define a final feed in the end with what we see is available in the market a year or two from now. And it's conceivable that, you know, after one year of operations we may adjust that

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because we see new options in the market. That's why, you know, saying that we will use this feed today, in four years we may have a very different feed in operation, but the limitations we always will work with is the assumptions that discharge is based upon and that's what we need to operate within.

AUDIENCE MEMBER: (Bethany Allgrove.) So I heard conservative figures and maximum figures and then I'm still trying to figure out where the numbers come from.

MR. HEIM: Yeah. So conservative maximum is sort of the same thing for us. We set maximum levels --

AUDIENCE MEMBER: (Bethany Allgrove.) Okay.

MR. HEIM: -- that are conservative for us. That means we have a lot of room to wiggle in in terms of adjusting feed formulas in the end and that's important for us.

MS. RANSOM: I can maybe help. I think if I'm understanding you, you're wondering, well, what happens if the number we put up today for the total nitrogen, for example, has to change because his feed source changes and that feed has a different amount of nitrogen coming out of that. The answer to that is he's put out a maximum that he believes his feed

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will be that number or less. So the way the permitting works is he's going to have a permit where there is going to be a level set that says this is how much nitrogen you're allowed to have come out of your facility daily, weekly, monthly, and he's going to have to adhere to that. So as long as the food choices get better and his feeds improve it's fine. You know, maybe he is instead of discharging 5 milligrams per liter of something he's now discharging 3, that's fine, he will meet his permit. But if he wants to go over that in the future, he would have to reapply for a new permit because he would then, you know, in theory be violating the permit by discharging too much. So he can -- he can come up with assumptions now that are based on realistic understanding of what the feed sources are, but when the final formulations come out as long as they leave him with the discharge that's lower he's okay.

AUDIENCE MEMBER: (Bethany Allgrove.) Okay. That answers my question. Thank you. I'm also asking if you can provide the ping pong balls. I'd like to see those -- I'd like to see what's coming from Bucksport added to the ping pong balls that are going to be in Belfast and then after their two weeks

where they leave the bay, I want to see them in Lincolnville. I'm very concerned about the beach qualities for Bayside and for Lincolnville, so if we can get the study expanded to show how it's going to affect all of Penobscot in a cumulative manner that would certainly help a lot of the concerns that the whole mid-coast has, not just Belfast.

MR. DILL: I can --

MS. TOURANGEAU: Okay. I'm getting the heads-up. We've got one more person after her, do we have time to and then take this gentleman quickly?

AUDIENCE MEMBER: (Custodian.) Very quickly.

AUDIENCE MEMBER: (Police Officer.) It could be a 15 minute question.

MR. DILL: With the ping pong ball, so there was -- first there was the animation that showed that has ping pong balls everywhere, that's not really representative of the discharge. We were starting them all over the place. We did another simulation where the ping pong balls were being released steadily from where the discharge location is and we ran that long enough so that they were essentially spreading out to the point that any impact they would have is minuscule. Dilutions, you know, of orders of

magnitude of like 10,000, so where it would be impossible to even measure the impact. And that area where you get that distance where you get to that area was totally shown within those figures, so you're so far away at that point that there is really -- there is really no impact essentially.

AUDIENCE MEMBER: (Bethany Allgrove.) Okay. So and that information will be in the permit, the study?

MR. DILL: Yes.

AUDIENCE MEMBER: (Bethany Allgrove.) Okay. Thank you.

AUDIENCE MEMBER: Hi. My name is Sid Block, B-L-O-C-K. I appreciate your patience. I'll help you clean up. I'm from Northport and my question, I had hoped somebody would ask, but nobody did. I don't understand why the pipe and the discharge are coming out so close to Northport along Bayside as opposed to going more directly out into the center of the -- of the bay. You're going right past the residential area and a community area with a beach and your dock and things like that as opposed to going directly out into the bay, so that is my question and a good comment.

MS. TOURANGEAU: I'm going to take a quick

shot at that and grab me if I'm wrong. I believe what we did was look for access to the bay that got us to the deepest area quickest.

AUDIENCE MEMBER: (Sid Block.) Okay. And --

MS. TOURANGEAU: Is that right?

MS. RANSOM: Yes.

AUDIENCE MEMBER: And my quick comment since Mr. Heim did mention the benefits of this even though this was a discharge situation is that before I lived in Northport I lived in Belfast and I do not remember when MBNA came to Belfast or Front Street Shipyard came to Belfast that my property taxes ever went down.

AUDIENCE MEMBER: That's right.

MS. TOURANGEAU: Thank you all.

(Hearing concluded at 9:17 p.m.)

C E R T I F I C A T E

I, Robin J. Dostie, a Court Reporter and Notary Public within and for the State of Maine, do hereby certify that the foregoing is a true and accurate transcript of the proceedings as taken by me by means of stenograph,

and I have signed:

_____

Court Reporter/Notary Public

My Commission Expires: February 6, 2019.

DATED: October 16, 2018