MANITOBA CLEAN ENVIRONMENT COMMISSION

KEEYASK GENERATION PROJECT

PUBLIC HEARING

Volume 7

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Winnipeg, Manitoba

WEDNESDAY, OCTOBER 30, 2013

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APPEARANCES

CLEAN ENVIRONMENT COMMISSION
Terry Sargeant - Chairman
Edwin Yee - Member
Judy Bradley - Member
Jim Shaw - Member
Reg Nepinak - Member
Michael Green - Counsel to the Board
Cathy Johnson - Commission Secretary

MANITOBA CONSERVATION AND WATER STEWARDSHIP
Elise Dagdick
Bruce Webb

KEEYASK HYRDOPOWER LIMITED PARTNERSHIP
Doug Bedford - Counsel
Janet Mayor - Counsel
Sheryl Rosenberg - Counsel
Bob Roderick - Counsel
Jack London - Counsel
Vicky Cole
Shawna Pachal
Ken Adams
Chief Walter Spence
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Chief Betsy Kennedy
Chief Michael Garson

CONSUMERS ASSOCIATION OF CANADA
Byron Williams - Counsel
Aimee Craft - Counsel
Gloria Desorcy
Joelle Pastora Sala

MANITOBA METIS FEDERATION
Jason Madden - Counsel
Ms. Saunders

MANITOBA WILDLANDS
Gaile Whelan Enns
Annie Eastwood

PEGUIS FIRST NATION
Lorraine Land - Counsel
Cathy Guirguis - Counsel
Lloyd Stevenson
Jared Whelan

CONCERNED FOX LAKE GRASSROOTS CITIZENS
Agnieszka Pawlowska-Mainville
Dr. Stephane McLachlan
Dr. Kulchyski
Noah Massan

PIMICIKAMAK OKIMAWIN
Kate Kempton - Counsel
Stepanie Kearns - Counsel
Darwin Paupanakis

KAWEECHIWASIHK KAY-TAY-A-TI-SUK
Roy Beardy

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Wednesday, October 30, 2013

Upon commencing at 9:30 a.m.

THE CHAIRMAN: Good morning. Welcome back to day seven. Also happens to be We Day in Winnipeg. So while the youth of our community get to hang out with Martin Sheen and Martin Luther King 3rd, you get to hang out with me, so...

We'll resume cross-examination on the Aquatic Panel, Pimicikamak. Ms. Kearns?

MS. KEARNS: Thank you, good morning.

So I will start slide 19 for the first set of slides. So this is the slide on the CAMP program. And Mr. Davies, my question to you is, could you describe the limitations to this existing aquatic monitoring program?

MR. DAVIES: I can provide a long list of the benefits of the monitoring program. I'm trying to think of some of the things that -- I guess one of the items was it would have been nice to have started this earlier. We are getting a long-term database now, as of 2008. We do have a long-term database starting as of 2008 and going on into the future. And I had noted why, the CAMP program came into existence with the memorandum of understanding in 2006. And as I said, the only

thing I can think of right now is it would have been nice to have the aquatic program started earlier, but that's when it came into being.

MS. KEARNS: Thank you.

So that's my only question in that set of slides, so I'll move on to the other set.

While it's being flipped over, Dr. Schneider-Vieira, you referenced the fact in your presentation that the population of sturgeon in Stephens Lake is not presently viable. Is this because Stephens Lake is a reservoir for the Kettle Generation Station and not an actual lake?

MS. SCHNEIDER-VIEIRA: We have spent quite a lot of energy and thought, quite a lot of interest has been focused on the topic of why there are no sturgeon, or so few sturgeon in Stephens Lake. Since it is one of our proxy environments for the Keeyask Generation Project, so we really wanted to know what had happened. We have the Aboriginal traditional knowledge from Fox Lake which tells us that prior to the construction of Kettle, that there were sturgeon there. That doesn't give us a concrete number, we can't say there are 1,000 or 2,000 or whatever, but we do know they used to harvest sturgeon in the main

stem of the river close to Gillam, as I understand it, and also I believe at the mouth of the Butnau River before it was diverted and so on. So we do know there were sturgeon present.

Fox Lake has also reported that after Kettle was constructed, that the sturgeon were no longer there. And obviously, they weren't in the locations where they had been found previously because that was highly flooded.

Now, we do know that there were sturgeon at Gull Rapids through the early '70s and into the 1980s. There are records of people actually harvesting the sturgeon. They were actually targeted both in a commercial fishery in the '70s as well as noted in bycatch in the '80s.

So when we go out today, what we see basically is very few, very young sturgeon. We know that if the habitat was -- well, we know that the adult sturgeon that were born prior to the construction of Kettle Generating Station should still be there. So because there are no adult sturgeon, we feel that they have either been harvested, which we know there is a record of some of that, and there's also the potential that they left. That is one of the reasons why we keep on

stressing the potential emigration of adults from the reservoir as being a possible effect.

In terms of the young sturgeon, we do know that there are some young sturgeon there now, and it looks like there is habitat that's suitable for them. And certainly, we did from the early 2000s also have some records of mature sturgeon that we thought were gathering to spawn in Gull Rapids. So it looks like those two life stages are there.

So, currently, our working hypothesis is essentially loss of adults through harvest and loss of adults through emigration.

MS. KEARNS: Thank you.

So turning to slide 13 of the second set of slides, Dr. Schneider-Vieira, you mentioned that there were no technical data on water quality prior to the 1970s and that this limits the ability to assess the effects of the CRD, LWR and Kettle on water quality. But my question is, based on what is known, is it possible for you to provide a likely direction of historical changes interpreted A levels in the main stem of the lower Nelson River?

MS. SCHNEIDER-VIEIRA: There is not

that much -- well, as I say, turbidity varies considerably over time. In Stephens Lake itself, or in the thing that became a reservoir over time, in the initial years post impoundment, there was an increase in turbidity, and then that declined again over time. I mean, it was limited data, but that is the information that we have for that area.

If you go out today, you could see, and I don't know if you've been in the area, but certainly the southern part of Stephens Lake is much more turbid than the north arm, which has become quite clear.

Now, you also asked whether I have any information that can address long-term changes in water clarity on the Nelson River main stem related to LWR and CRD. And apart from noting that the Burntwood River is more turbid than the Nelson River, so increased flows, because CRD increased the flows on the Burntwood, there is proportionately more turbid water entering the system. I can't comment on terms of long-term changes. There weren't such substantial changes that they were detectable based on the information that we have.

MS. KEARNS: Okay. Turning to slide 19, the second large bullet reads, this is about water quality:

"During operation, effects to water quality in flooded area, 10 to 15 years, and permanent reduction in TSS in lower reservoir in southern portion of Stephens Lake."

So is it correct that peat land disintegration could continue for at least 30 years?

MS. SCHNEIDER-VIEIRA: I will leave James to answer that question.

DR. EHNES: That is correct.

MS. KEARNS: And so do you predict that there will be detectable increases in nutrients and a decrease in dissolved oxygen beyond 15 years post project?

MS. SCHNEIDER-VIEIRA: Not -- we expect that the water quality will be very similar to other, like, for example, the shoreline areas or the shelter bays along Stephens Lake. The main inputs are happening actually in the very first few years. And after that, it will be a very low amount.

MS. KEARNS: So despite that the peat

is continuing to disintegrate, there won't be any detectable changes in the water quality?

MS. SCHNEIDER-VIEIRA: The amount of peat entering the system after 15 years is very, very small.

MS. KEARNS: So slide 23 then, is it correct that common carp has moved into the lower Nelson and Churchill Rivers?

MS. SCHNEIDER-VIEIRA: Common carp were actually first observed in Split Lake in 1963. That was prior to any hydroelectric development, prior to LWR and CRD. And I should also note that they are very, very uncommon in the area, and that we have only found them actually in the large mesh gill nets that we use for lake sturgeon. And that the abundance of carp in those nets is actually lower than the amount of carp, so there are a few carp but they are very uncommon.

MS. KEARNS: And what are the expected implications of the presence of the common carp in the lower Nelson River on the fish community and habitat once Keeyask is built?

MS. SCHNEIDER-VIEIRA: Because there are so very few carp and we see very, very few carp at Split, and also in Stephens, we don't

expect there to be any effect.

We would note of course that we are aware, and actually cite it in our document, that they have had a substantial effect on some freshwater environments in Southern Manitoba.

MS. KEARNS: Okay. Turning to slide 32, this slide refers to the limited present movements of adult Walleye, Lake Whitefish and Northern Pike upstream and downstream over Gull Rapids.

And Dr. Schneider-Vieira, you mentioned that this movement is unusual; is that correct?

MS. SCHNEIDER-VIEIRA: I mentioned that there is a very small proportion of the fish that have moved.

MS. KEARNS: So my question is, how important can these rare movements within a fish population be for the long-term resilience of a fish population in a river system?

MS. SCHNEIDER-VIEIRA: In terms of the -- well, I'm going to divide it into both upstream and downstream. Where these long-term movements are important is, well, there's usually, there are two concerns, one if you have headwater

lakes or some such environment that are isolated, where you are concerned that there might be a local extinction. So a certain species disappears and then never comes back.

The other concern is with genetic interchange.

In our case, we were talking about the Gull Lake area, which is upstream of the generating station. That's connected basically to the entire Nelson River watershed. So we are not at all concerned about that being genetically isolated, or there being a potential for a local extirpation of a species, because it's connected to a huge system.

Downstream in Stephens Lake, that lake will always receive some input from upstream, because there are fish that continue to move downstream through the station, either past the turbines, or over the spillway, or as younger fish as well.

MS. KEARNS: Turning to slide 34, the first bullet under operation reads:

"Initial decline in reservoir due to loss of aquatic plants in near shore area will recover when plants are

re-established in 10 to 15 years."

Is it correct that the aquatic plants are expected to re-establish but perhaps only partially?

MS. SCHNEIDER-VIEIRA: Yes. Depending on, the plant growth in the existing environment is highly variable depending on water levels, because we have had both droughts when the water levels are high -- sorry, droughts when they are low and floods when they are high. And basically the plant beds moved up and down, depending on what the water level is, and it takes usually a season to regrow.

Within the long-term, in terms of the long-term average, we are predicting that the amount of plant beds will be somewhat lower, and that depends on how much cycling versus baseload at the station does.

MS. KEARNS: Thank you.

Is it correct that there can be long periods of time between spawning for lake sturgeon, for an individual lake sturgeon?

MS. SCHNEIDER-VIEIRA: An individual female spawns every five years and the spawning interval -- or is thought to spawn every five

years in our area. For males, it's less. It can be two to three years.

MS. KEARNS: Does the interval of spawning for an individual sturgeon have any relationship to the habitat conditions of that fish?

MS. SCHNEIDER-VIEIRA: I believe that it is related in part to how quickly they are able to. Basically they are growing eggs internally, if you will, and so it is shorter certainly when they are, for example, in more southern environments where it is warmer, they do have a shorter, or they tend to have a shorter spawning interval.

MS. KEARNS: So do things like water quality and water flow patterns have any impact on the interval for spawning?

MS. SCHNEIDER-VIEIRA: I'm not aware of any effects of water flow patterns or water quality. I should note that there have been places in other locations where there was substantial water pollution associated with pulp mills where that had an adverse effect on sturgeon populations, but that isn't our concern in this area.

MS. KEARNS: Okay. So then turning to slide 57, the last bullet on this page reads:

"Sturgeon still relatively abundant in Stephens Lake until at least the 1980s (local resource users)."

How many people have said this?

MS. SCHNEIDER-VIEIRA: I'm just going to check with my team. I'm thinking that there were about three, but let me just check, please? Two.

MS. KEARNS: And did anyone say the opposite or something different than that?

MS. SCHNEIDER-VIEIRA: Not that I'm aware of. And we also -- yeah, not that I'm aware of, and I didn't see, apart from in the Fox Lake traditional knowledge report where they reported the decline at initial impoundment, they didn't tie further changes to any specific years that I can recall.

MS. KEARNS: Okay, thank you.

So turning to slide 60, this is a map of the populations in the study areas. And I'm interested in the location downstream of Kelsey.

And Dr. Schneider-Vieira, you mentioned that there were a couple of fish caught

with eggs in that area; is that correct?

MS. SCHNEIDER-VIEIRA: Yes, that's correct. And I should clarify that with female sturgeon, it's difficult to determine the sex of a sturgeon when you catch it except for when it's right in spawning condition, and it's releasing either milt or eggs. And females, in particular, you can only basically make it extrude an egg when it's almost ready to spawn.

MS. KEARNS: And when were those fish caught?

MS. SCHNEIDER-VIEIRA: Just a minute, let me check.

One in 2006 and one in 2013.

MS. KEARNS: Is that the total extent of information we have about spawning in that location?

MS. SCHNEIDER-VIEIRA: Yes, we have done quite a few years of gill netting and we did not find evidence of any other spawn. That's why we listed it as a suspected spawning, because it's not definitive. We do know that prior to the construction of Kelsey there were, I mean, it was spawning location.

MS. KEARNS: When was the last

indication of spawning observed at Gull Rapids?

MS. SCHNEIDER-VIEIRA: I believe the early 2000s. We didn't have -- we have never collected larval fish from Gull Rapids. There were some fish that were in spawning condition.

MS. KEARNS: Thank you.

So turning to slide 70. So on this slide, you mentioned Pointe Du Bois, and it was mentioned a few times in your presentation yesterday.

And my question is: So Pointe Du Bois, I should preface, was mentioned as a place where Manitoba Hydro has tried spawning habitat creation; is that correct?

MS. SCHNEIDER-VIEIRA: Yes, that's correct.

MS. KEARNS: So could you please describe the relevant differences between the Pointe Du Bois area and the Keeyask area in terms of habitat conditions for sturgeon and flow patterns?

MS. SCHNEIDER-VIEIRA: In terms of what the Keeyask Generating Station would look like in the future you mean?

MS. KEARNS: Both the present

condition comparison and post project?

MS. SCHNEIDER-VIEIRA: The most substantial difference between Keeyask and Pointe Du Bois at present is that there is a very large number of sturgeon at Pointe Du Bois. So when you go out to study spawning sturgeon, you have several hundred that are aggregating there and you can see how they are responding to the habitat.

In the Keeyask area, there are very few. Downstream of Gull Rapids, as I mentioned, we haven't found any for a number of years. We do usually catch a few spawning sturgeon in the vicinity of Birthday Rapids. But basically it's the quantity, the number of sturgeon is very, very different.

MS. KEARNS: So the habitat conditions are identical then?

MS. SCHNEIDER-VIEIRA: No. I mean, one is -- I was going to say the Winnipeg River, it's somewhat smaller, it is -- I was doing to say it is more of a boreal -- well, actually they are both boreal shield rivers. There is more white water at Gull Rapids, it is much stronger. At Pointe Du Bois, it is going through a generating station. It is a little bit less turbulent, a

little less wild, if you will. It is also easier from a practical point to get in there to try and catch sturgeon when they are in the act of spawning.

MS. KEARNS: So once Keeyask is built, so if we were to do a comparison between the two, how would the habitat differ between the Pointe Du Bois area and the Keeyask area?

MS. SCHNEIDER-VIEIRA: The Pointe Du Bois Station is quite an old station. It has, I was going to say 13 units, or perhaps even more, I am not entirely sure, so the flow is distributed quite widely.

Keeyask would have seven units -- 16 units I am told. Keeyask would have seven units and each of those units would provide more flow because the station is much more, it's a much larger river up there.

In addition, downstream of Pointe, it was built over a hundred years ago now, there is considerable amounts of rubble. Like the bottom is much more complex, if you will.

And Keeyask, the tailrace itself will be smooth and designed for passing outflow in a uniform way. But the structure that we're

building will be along the one shore, and that will have sort of the rough stones and the variation in flows that we know that are attractive to sturgeon when they spawn.

MS. KEARNS: And is the water velocity different at Pointe Du Bois than it will be after Keeyask?

MS. SCHNEIDER-VIEIRA: In terms of over the spawning structure, the water velocities will be in the range that sturgeon use to spawn, and that is also what we see at Pointe Du Bois.

MS. KEARNS: So you mentioned about the observed movements of sturgeon in a few slides yesterday, and the fact that there haven't been many. But is it possible that during operations, once the reservoir is flooded, that there may be more sturgeon than recently observed that will try to move downstream and get out of the reservoir?

MS. SCHNEIDER-VIEIRA: I'll divide your question into two. The first one is, will there be a movement of sturgeon downstream when the water levels change as a result of impoundment? Now, that is something that we have some evidence might have happened at Limestone. We have had a discussion about whether or not that

potentially happened when the Kettle Generating Station was constructed, and that certainly has been observed in a reservoir that was recently impounded in Quebec. So that's basically at impoundment.

Now, later on when the station is in operation, it will depend on how the sturgeon respond to the modified environment. We have seen some instances, some reservoirs where there's very little downstream movement, and some there is also more. For example, there is some work that was done on the Winnipeg River where they recorded, I'm just trying to remember now the number, four and a half per cent of the adults were moving downstream. That is higher than we see currently from Gull Lake, and it's also higher than we've seen in some of the other reservoirs. And it really seems to be related in the habitat within the reservoir and approaching the generating station.

MS. KEARNS: And so if it turns out that the sturgeon in this case do move downstream at a higher rate, would this increase the mortality in the turbines?

MS. SCHNEIDER-VIEIRA: The sturgeon

that we have seen from the work that we have done in terms in looking at sturgeon that have gone downstream with acoustic tags, there has been quite a high proportion -- I was going to something like one in 10 -- we have observed about 10 sturgeon going downstream through the lower Nelson River stations, and I believe one we haven't seen again, so that could potentially be a mortality. The other sturgeon we know are still moving around.

In terms of most sturgeon that move downstream, we think are going over the spillway, if they are large. Smaller sturgeon could fit past the trash racks, but the larger ones, most of them seem to be turned away by the trash racks, though there's some uncertainty with that.

MS. KEARNS: But if there's more sturgeon moving downstream, then there could be more that die?

MS. SCHNEIDER-VIEIRA: Yes.

MS. KEARNS: And at one point during your presentation yesterday, Dr. Schneider-Vieira, you mentioned that there is currently more habitat in the Keeyask area than sturgeon. Is it possible that the existing fragmentation of the lower

Nelson River is the cause of the fact that there are fewer fish than habitat?

MS. SCHNEIDER-VIEIRA: I will just clarify that for you. I said there's more habitat than sturgeon actually in the upper Split Lake area, that is to the Burntwood River and to downstream of the Kelsey Generating Station, and also in the Grass River. Those are all areas where there are substantial amounts of habitat.

I think it is also worth noting that in the area that we have been focusing on, that is from Stephens Lake, through Gull Lake, up into Split Lake and those river segments. As I mentioned in my presentation, there is over 200 kilometres of habitat length in that area. So that is not what most people would think of as a highly fragmented area.

So then I guess the answer is no, I wouldn't attribute the low number of sturgeon in that area to habitat fragmentation.

MS. KEARNS: So the first areas that you listed, though, the ones, the Burntwood --

MS. SCHNEIDER-VIEIRA: They are all interconnected.

MS. KEARNS: And so your answer for

that area is that, no, fragmentation is not the reason for the low numbers?

MS. SCHNEIDER-VIEIRA: That's true. And I also want to point out, because I think it's an interesting observation, that from the genetic work we did, that the sturgeon in Gull Lake are actually genetically different from the ones in the upper Split Lake area. So that implies, or that tells us that even with no physical barriers, there are some rapids which we know they can pass, but even with no physical barriers, the sturgeon themselves are using subsections of the river consistently enough that they are genetically different. And that genetic difference actually arose prior to any hydroelectric development.

MS. KEARNS: And so turning to those genetic differences, would you agree that if brood stock has to be used that's genetically different than the existing population in the Gull Lake area, that this would have a negative impact on the existing sturgeon population?

MS. SCHNEIDER-VIEIRA: We would certainly attempt to collect brood stock from the same location to which we are stocking. That is one of the things that is being considered in the

stocking plan, as well as in how fish will be raised in the hatchery, to keep those genetic lines distinct.

If we find an area is entirely extirpated, there is no other source of sturgeon as, for example, happened in the upper Nelson River, then you would have to use stock from, brood stock from some adjacent area where you think it is genetically the most similar.

MS. KEARNS: And if you did have to use genetically different stock, would that have a negative impact on the existing sturgeon?

MS. SCHNEIDER-VIEIRA: Well, if we still had existing sturgeon, we would be attempting to use those. In addition -- so then the answer would be no, because we're using the same ones.

If we find that we absolutely cannot find any stock from our local areas, for example in Stephens Lake, we would be using brood stock from Gull Lake, which is the next adjacent one. And we do know that there is downstream movement from, or downstream drift in the existing environment from Gull into Stephens Lake.

MS. KEARNS: And so then there would

be no negative effects by using genetically different fish?

MS. SCHNEIDER-VIEIRA: Okay. If we absolutely had -- so what you're asking me about is the hypothetical case where I still have an existing population, but I choose to get my brood stock from some other location?

MS. KEARNS: Yes. Yesterday in response to some questions you talked about the challenges in getting enough spawning material, and particularly because you don't want to use the same female every year. And so my follow-up question to that discussion from yesterday is, if there are those challenges and you are unable to get genetically identical fish, would there be negative consequences for the existing population?

MS. SCHNEIDER-VIEIRA: I think, once again, we would get to the actual -- I was going to say the actual issue at hand. If there is obviously a concern, and there would be a concern about negative consequences to a stock if you introduce genetic material from some other stock, if you have evidence that they are different, and that's why we would like to avoid it.

However, if we're down to the level of

where there's only one or two spawning females in an entire population, that also has negative consequences. Because, essentially, you have no more natural genetic diversity.

So in all cases you basically have to look at what the best overall situation is.

It's not as if we would, for purpose of convenience, go to somewhere where there are abundant sturgeon and collect the eggs there, and then go and release them at another location. We would only be looking at using eggs from a different location, or milt from a different location, if we feel that we can't get stock from the location that we're targeting? And that would basically reflect a very, very severely depleted adult population, in which case that in itself is causing a genetic problem for that location.

MS. KEARNS: So then it would be a negative consequence, but one of many negative issues for the population?

MS. SCHNEIDER-VIEIRA: Yes.

MS. KEARNS: So how far upstream does the zone of influence for the Kelsey Dam operation extend?

MS. SCHNEIDER-VIEIRA: I'm sorry,

Kelsey or Keeyask?

MS. KEARNS: Kelsey.

MS. SCHNEIDER-VIEIRA: The effects of Kelsey, I believe extend up into Sipiwesk Lake. Let me just check, please.

It extends up into Sipiwesk Lake, and so the lower portion of the Landing River, which we discussed yesterday, was affected by the Kelsey Generation Station.

MS. KEARNS: Thank you.

Mr. Davies, I have a couple questions for you about studies you mentioned yesterday. The first is you mentioned a 20 year study on Cross Lake fish populations following construction of the Cross Lake weir.

Is there a report available on the results of that work?

MR. DAVIES: Yes. We're doing it, actually, we had been doing it with the Cross Lake First Nation originally, and now Pimicikamak. A copy of the report for at least the first 10 years, and probably 15, and it may still be ongoing, I'm a bit divorced from that, have been given to Glen Smith in Cross Lake as they are being produced.

MS. KEARNS: Is it publicly available elsewhere?

MR. DAVIES: It's given to the Pimicikamak in Cross Lake.

MS. KEARNS: So that's it, one copy was sent and there's no other copies?

MR. DAVIES: No. In order to conduct a fisheries investigation, we need a collection permit, and as part of the collection permit, we are bound to provide a copy of the report to the Provincial Government. So a copy of the final report goes to the Province of Manitoba and becomes part of the public record.

MS. KEARNS: So that would be where, at like a Manitoba library somewhere?

MR. DAVIES: It would be at Manitoba Conservation and Water Stewardship.

MS. KEARNS: Thank you.

Mr. Davies, you mentioned in passing, in a response to a question yesterday, the effect of Whitefish eating Rainbow Smelt. Could you provide a reference to any report on that issue?

MR. DAVIES: It's actually Walleye that are eating the Rainbow Smelt.

MS. KEARNS: Thank you.

MR. DAVIES: And the majority of information that's available on that is actually from ATK. A lot of the commercial fishermen are complaining that the quality of the Walleye is deteriorating. And one of the things that the commercial fishermen are doing now is they are trying to process the Walleye faster so that we don't receive this belly burn and still receive the higher prices for the Walleye.

In one way, the Rainbow Smelt actually are advantageous to the fishery because they are a very high calorie fish, and Walleye are growing very fast because they are feeding off of them. And as long as the fishermen, fishers, are able to clean the fish and get the contents of the stomach out fast enough, they are fully marketable. But they do have belly burn if they stay in too long.

MS. KEARNS: Thank you.

Yesterday, Dr. Schneider-Vieira, you agreed that the mitigation measures that are being proposed to recover sturgeon as part of the Keeyask project could be done without Keeyask. Is that correct?

MS. SCHNEIDER-VIEIRA: You mean, you are referring to the stocking program?

MS. KEARNS: Yes.

MS. SCHNEIDER-VIEIRA: Yes. And I did note, and I would leave it to actually Shelley to comment on what the sturgeon stewardship program might do in the absence of Keeyask.

MS. KEARNS: I just wanted to confirm that that's what you said yesterday?

MS. SCHNEIDER-VIEIRA: Yes, but I did note that what they would -- it would really depend on decisions that are made in terms of funding and so on. That's why I believe that Shelley should comment further on that.

MS. MATKOWSKI: The lower Nelson River sturgeon stewardship committee is concerned with that particular area. And as I mentioned in my presentation yesterday, they are making plans for projects and actions that they will undertake, and that could include stocking. But they certainly will not have the resources to undertake a similar stocking program to the one that's proposed under Keeyask.

MS. KEARNS: Okay. So this could be to either of you. Would you agree then with the statement that if sturgeon are better off in the lower Nelson River after Keeyask, it will be in

spite of Keeyask and not because of it?

MS. SCHNEIDER-VIEIRA: The Keeyask project would provide basically the funding to support a very comprehensive stocking program, including -- well, it's over 25 years, targeting not only the area affected by Keeyask, but also the upper Split Lake area. And that would represent a substantial increase in the number of sturgeon in the reach of the Nelson River between the Kelsey Generating Station and the Kettle Generating Station.

MS. KEARNS: But is it correct that the physical structure of Keeyask will destroy sturgeon habitat?

MS. SCHNEIDER-VIEIRA: The physical structure of the Keeyask Generating Station will destroy sturgeon spawning habitat at Gull Rapids. Because of our proposed habitat compensation measures, that doesn't imply that the area will be able to support fewer sturgeon, because we are basically targeting, providing -- basically, we are providing alternate habitat. So it's not as if there would be fewer sturgeon because of the Keeyask Generating Station considering the habitat measures that we are using.

MS. KEARNS: Okay, thank you.

Those are my questions. Thank you.

THE CHAIRMAN: Thank you, Ms. Kearns.

Fox Lake Citizens, Mr. McLachlan?

MR. McLACHLAN: Would it be appropriate to introduce Mr. Massan here?

THE CHAIRMAN: Of course.

MR. MASSAN: Hello, my name is Noah Massan. I live in Gillam. Well, it was to be Fox Lake, but it's Gillam anyways. Thank you.

MR. McLACHLAN: So we'll be working on this together, and Noah has comments, and I have questions for the panel.

THE CHAIRMAN: I would just note, it's not a time for comments, it is a time for questioning.

MR. McLACHLAN: Yeah, questions and responses to observations that are made by the panel. We'll present it in the form of questions.

THE CHAIRMAN: Okay.

MR. McLACHLAN: So, as with all the other intervenors, I'm going to be going through the slides as presented here.

Thank you very much for your presentations.

I guess we could start by looking at slide 2355. And so obviously here we're talking about historic conditions. And under technical studies, you mentioned that it's difficult to make comparisons because of changes in methods over time. That might be in terms of formal analysis, but can you speak more, in more detail about some of the kind of qualitative differences you have seen over time?

MS. SCHNEIDER-VIEIRA: The studies that were done were basically looking at the comparison of work, of data collected in the 1980s during the Manitoba environmental or ecological monitoring program, to present day. And there were some evidence that some fish species became relatively more abundant.

I would have to check for a second. I believe that it was that Walleye became potentially less abundant, but let me just double-check that, please.

If you're interested in knowing the actual species, I'll have to take a minute and look it up in the section of the aquatic environment supporting volume.

MR. McLACHLAN: Well, maybe -- could

somebody in your team do that and we could continue?

MS. SCHNEIDER-VIEIRA: Okay, that's fine. I'll just let you know when we find it out.

MR. McLACHLAN: But would you attribute, what would you attribute those changes that we haven't described yet to?

MS. SCHNEIDER-VIEIRA: There was a suggestion by one of the DFO scientists, I believe, that could have been related to variations in commercial fishery. What we're talking about here are changes in Split Lake where there is a commercial fishery. That commercial fishery was closed down in the early 1970s because there were mercury concerns related to mercury concerns on Lake Winnipeg. And the overtime, if you close down the fishery, basically, you can see some shifts in the relations between Walleye and other species such as Sucker and Pike.

MR. McLACHLAN: Along the same line, what about changes in species composition associated with Kettle?

MS. SCHNEIDER-VIEIRA: There wasn't any fisheries work done early on in association with Kettle. For that area, we relied on the

traditional knowledge from Fox Lake.

MR. McLACHLAN: So there were no scientific studies before --

MS. SCHNEIDER-VIEIRA: Not early on, not related to the construction of the Kettle Generating Station.

MR. MASSAN: Back in early '60s and '70s, there was studies being done, I think the Province of Manitoba is doing it. Because one time we were at Gull Rapids, the chopper landed there. At that time there was helicopters, they had a bubble. They asked us what we are doing here. We said we're fishing. And then I asked him, what are you doing? He said, oh, we're studying fish along the Nelson, like Gull Rapids and below Kettle. Because they told me there was a hydro dam going to be put up in Kettle. So what happened to that study there? I even seen them beyond there. I seen them at Angling River too one time. What happened to that? Where were you guys before? You know, you guys had been studying this before. People keep telling us, you guys are 40 years behind.

We had a lot of fish before in our community, in the river.

MR. DAVIES: There were actually studies conducted in the 1960s and 1970s, there were some studies that were conducted prior to the Lake Winnipeg/Churchill/Nelson River Study Board reports, which occurred from 1972 to 1979, but also some work that was done by Dr. Kachinsky in some of the areas prior to that, particularly in Playgreen Lake area, but also in other spots.

There may have been studies that were occurring in that general area where you would have seen a helicopter, but they may not have specifically been in that particular area. Most of the work on Stephens Lake was conducted under the Manitoba Ecological Monitoring Program, which was the one that started in 1985.

MS. SCHNEIDER-VIEIRA: Sorry, I have in front of me now the figure, and if you're interested in looking at it, it is in the aquatic environment supporting volume, figure 5-1, and it compares a catch per unit effort between studies done from 1983 to 1989, as part of the Manitoba Ecological Monitoring Program, as well as the work done by North/South Consultants as part of the EIS studies for Manitoba Hydro and the Partner First Nations.

And it just shows a higher, in '83 to '89 period there were relatively more Cisco, Whitefish, Sucker and Mooneye, and relatively fewer White Sucker, Walleye and Northern Pike.

MR. McLACHLAN: And you still attribute that to the commercial fishing when you look at the figure now?

MS. SCHNEIDER-VIEIRA: No. On Stephens Lake, we wouldn't attribute that to the commercial fishing. There we had thought that it could be related to differences in the methods.

MR. McLACHLAN: What about changes in sturgeon populations that emerge from those past studies?

MS. SCHNEIDER-VIEIRA: Within the Stephens Lake itself, as I mentioned in the response to the earlier question, we relied on the Aboriginal traditional knowledge from the Fox Lake people, including Mr. Massan, to tell us that prior to the development of the Kettle Generating Station there were sturgeon in that area. And they noted in the reports that they prepared where they did see the sturgeon.

The first sturgeon studies that I'm aware of for Stephens Lake were actually started

in the early 2000s, as part of the work being done for the Keeyask Generating Station.

MR. McLACHLAN: And today you describe some of that, but you described it in very kind of general kinds of ways. In terms of those interviews with Mr. Massan and others, did you try to get at actual numbers in terms of harvest and, you know, kind of energy that was put into harvesting, or those kinds of data as well?

MS. SCHNEIDER-VIEIRA: The Aboriginal traditional knowledge work done with each of the Partner First Nations was lead by those First Nations. And so the interviews that were done for Aboriginal traditional knowledge were done basically by Fox Lake themselves.

We did at some point provide some interview guidelines that asked for somewhat more detailed information. The extent to which they chose to follow those guidelines was obviously up, or those requests, was obviously up to the First Nations themselves.

MR. McLACHLAN: We have talked today about ATK and its use in describing past conditions, especially when scientific data aren't available.

Did you ask questions about future impacts, in terms of, did you see each value first of all in Aboriginal traditional knowledge, in predicting future impacts? And secondly, can you describe that?

MS. SCHNEIDER-VIEIRA: To clarify once again, the North/South Consultants did not do any of the traditional knowledge interviews. Those were done by the First Nation. They chose how to do the program, they chose who to interview. As I said, we had provided some suggestions and some requests, but the programs themselves were designed and implemented by the First Nations. There will be a panel, I believe, after this one that will talk -- that will be the First Nations and you'll be able to ask them about the methods that they used.

MR. McLACHLAN: Fine. I'm less interested in the methods and more about the predicted impacts. You have incorporated past impacts in your presentation, but you haven't talked about predicted impacts that arose out of the ATK.

MS. SCHNEIDER-VIEIRA: The predicted impacts from the Fox Lake First Nation were

discussed in the response to EIS guidelines, as well as obviously in their own report. And they raised concerns in particular in relation to effects to fish movements. And they also raised concerns -- I'm just trying to remember now, it is highlighted. Would you like me to pull out that part of the documents?

MR. McLACHLAN: Sure, that would be wonderful.

MS. SCHNEIDER-VIEIRA: Okay.

In terms of -- now, all of the First Nations prepared their own reports, as I'm sure you are aware. So here are just some of the key points specific to the aquatic environment that were referenced in the Fox Lake report.

One was, the first was, I should just provide you a page reference, it's the response to EIS guidelines, page 6-239 going on to page 6-240.

So, first of all, all the First Nations noted they felt that water levels on Split Lake would increase. There were concerns related to water level increases and the decay of peat and other organic matter. This erosion was expected to result in the deposition of more sediments on the bottom.

You'll notice a lot of these are very similar to the technical conclusions.

There are concerns related to spillway and turbine mortality, and an interest in looking at fish passage. As I mentioned yesterday, there were two fish passage workshops in Thompson where fish passage was discussed.

There were concerns with dewatering of the south channel of Gull Rapids, as being an area that needed, required some form of mitigation. And that is also actually a mitigation measure that has been undertaken.

Fox Lake members are concerned with the long-term viability of the sturgeon population in the Gull Lake area if Keeyask is built. And they expect that there will not be viable populations without significant restocking efforts. And there is concerns about the long-term success of those stocking programs.

There were concerns from some of the elders with respect to the collection of lake sturgeon eggs. And they also had indicated that, as we found in some of the technical work, that survival will be lower if the fish are released at a younger life stage.

And finally, there was the report that, as we have indicated, that when there is hydroelectric development, the suitability of fish for consumption in terms of palatability, their taste and texture declines. And that effect was expected to continue if Keeyask is developed.

MR. McLACHLAN: Great. Thank you.

MR. DAVIES: I'll just add one point.

We also noted that Mr. Massan had specific concerns about potential presence of baffle blocks downstream of the spillway.

MR. MASSAN: I thought we were talking about Gull Rapids, not Long Spruce, like about those baffle blocks.

MS. SCHNEIDER-VIEIRA: Yes. To clarify, Mr. Massan, you are correct that you had observed the baffle blocks downstream of Long Spruce.

MR. MASSAN: Long Spruce.

MS. SCHNEIDER-VIEIRA: As I recall, you were concerned if you put that in Keeyask, fish going over that spillway will be killed if they hit the baffle blocks. The advantage of the spillway at Keeyask is that it will not have baffle blocks. It's being developed in the

existing river channel, which is really hard bedrock, so there is no need for baffle blocks, or any kind of a deep basin like you see at the Kettle Generation Station either.

MR. MASSAN: The concern I had with baffle blocks at Long Spruce, why did they leave them? You know, I hear different stories from other Hydro people. They were put there for, once that forebay, Long Spruce Forebay was, the water went through the -- the guy that told me, he said to slow the water down when it comes through the spillway. I saw those baffle blocks were put in there, but why didn't they pull them out? They are still there. Because I noticed -- I said I go fishing down there sometimes. When they open the spillway, you see all the seagulls. So I started wondering why seagulls are all flying around over there. So I went and looked. I see a lot of dead fish around there, is that why those two baffle blocks are killing those fish, you know, when they let that water through the spillway?

MS. SCHNEIDER-VIEIRA: My understanding from the engineers is that Long Spruce, the situation in the spillway is different. And there those large blocks are still

required because when there's a spill, they need to put something in there to basically take some of the energy -- that water hits it and it uses up some of the energy. Otherwise, it would erode the shoreline or something like that.

MR. MASSAN: Well, Kettle is same thing. How come they didn't put baffle blocks in there?

MS. SCHNEIDER-VIEIRA: I'm sorry?

MR. MASSAN: They had the same kind of rock -- the rock was the same thing, granite. Long Spruce is same thing. But they didn't put baffle blocks at Kettle when they opened the spillway, it's just wide open. How come they couldn't do that for Long Spruce? They should take those baffle blocks out I think. But I don't know how they are going to do that because they jammed a bunch of rebar in there.

I was in the right place the same time. I made a road to those baffle blocks when I was operator, that's all I know. Because if I didn't bring that concern in Thompson, you know, they asked me how do you know about it? Because I work there to see. That's how I know these things. I was the operator. I made a road to

those baffle blocks, you know.

MS. SCHNEIDER-VIEIRA: I'm not an engineer, but what I understand is that in each, depending on the design of the spillway, sometimes you need a way to get some of the energy out of the water. So in Kettle, they used one kind of design, in Long Spruce they used baffle blocks but those baffle blocks are still required.

At Keeyask, we are fortunate in that baffle blocks aren't required because of the type of stone that will be present in the spillway, and that they will be able to use the existing river channel, which is very hard rock, so we won't need any stone, or to add baffle blocks in that area.

MR. MASSAN: Okay. I have a question. There is an engineer, but I'm not saying his name, he's Hydro, Manitoba, he works for you guys. He's an engineer, he told me different story. You're telling me all different too.

MR. McLACHLAN: Is there room within this process, if a question comes up for say another panel that has already presented, to follow up with them?

THE CHAIRMAN: Well, this really isn't an issue before this panel. We're looking at the

Keeyask Generation Station. I think it's a legitimate question that Dr. Schneider-Vieira has attempted to respond to, but it's not really a matter before this panel. I think that at some point, Manitoba Hydro has been directed to do a regional cumulative effects assessments, and that's the type of question that could be put at that time in that process.

MR. McLACHLAN: Maybe we can follow up at a later date around that.

THE CHAIRMAN: Yes.

MR. McLACHLAN: Okay.

So moving on, if we look at page 19, under the coordinated aquatic monitoring program? And it says here that it was first implemented, or kind of incorporated in management in 2008, but that it was designed earlier in 2006. Is that right?

MR. DAVIES: There was a memorandum of understanding that was in place between the Province of Manitoba and Manitoba Hydro in 2006. In 2007, there was a workshop and a number of discussions, and at the workshops we invited a number of external experts, people from the Department of Fisheries and Oceans, Department of

the Environment, external scientists, I think I mentioned that one of the individuals actually worked on the original Lake Winnipeg/Churchill/Nelson River Study Board reports, and a number of other government agencies to assist in developing the program to make sure that we had the full scientific expertise for this.

After 2007, there were very strict protocols that were developed and put in place to make sure that we didn't have the problem that we had in the past where data that were being collected weren't comparable. So the protocols were put in place in 2007 and the sampling started in 2008.

MR. McLACHLAN: And those protocols are still maintained now then?

MR. DAVIES: Yes, they are.

MR. McLACHLAN: So was CAMP, the description and the content included in the EIS?

MR. DAVIES: CAMP data was used in the EIS. And where it is, I believe it's noted.

MR. McLACHLAN: Now, I have been told that it's only mentioned in the glossary, but that there isn't a full description in terms of the

data that had been collected through CAMP. Is that right, or is it present in greater detail in some of the documentation?

MR. DAVIES: There were over 10 years of very directed field studies that were conducted for the Keeyask project. So the majority of the information collected for the Environmental Impact Statement was actually directed by the Keeyask studies itself. There was some information that was provided by CAMP that was also used, but it was supplemental information.

MR. McLACHLAN: And is that information available to the participants here, in any compiled manner?

MR. DAVIES: As I was saying, there is a website that's being developed, and it's a public website, and there is information on the website right now, and it will be populated within the near future so that people have access, immediate access to the information that's being collected.

MR. McLACHLAN: And so you're anticipating -- what's the time line that you are anticipating for that to take place?

MR. DAVIES: One moment, please.

I'll have to get back to you. As I said, the website is up and there is information on it. The types of information that will be put on will be more of a summary type for people to be able to understand what has been going on and the types of data that have been collected. If you'd like me to get back when there will be more information, I can do that.

MR. McLACHLAN: That would be great.

Do you anticipate that there will be raw data, or more detailed data outside of the summary information available on the website?

MR. DAVIES: Right now the plans are to put on, not the raw data itself, but the analyzed data. The primary reason is that the raw data usually isn't of much use to people. It is being shared with other organizations, but it's not really much use to people unless it's put in a way that people can understand. And we are trying to use the information that we're comparing, say mercury levels in one community to mercury levels in another lake, and then mercury levels in another lake, so that people have an idea of what the mercury levels might be in their lake as compared to Playgreen Lake, or Cross Lake, or

Split Lake, and provide a better understanding to the public.

MS. JOHNSON: Excuse me, could I just interrupt for a second? Is this an undertaking, are you asking for an undertaking, and what exactly are you asking for, just so we can have it on the record.

MR. McLACHLAN: Is that directed to me?

MS. JOHNSON: To both of you.

MR. McLACHLAN: I think there was a concern amongst some of the participants that there were data that had been collected through the CAMP that might have been useful in terms of making sense of past changes. And obviously, I mean, it's great this website is being developed, but perhaps there are other ways that those data could be made available in the interim, would be number one.

And number two, I guess I'm wondering if there's a way through that website, if people want additional information, if there's a process by which they could follow through that website to collect those data?

MR. DAVIES: I'd like to answer the

previous question first. I have just been told that the website is up and running, and that the information should be on in approximately three months, so relatively short time frame. And that the majority of the information that will be provided will be figures and tables. If there are requests for specific information, that will be made through Manitoba Hydro.

MR. McLACHLAN: For sure. Thank you. And as part of CAMP, were you collecting ATK as well in the past, or was it a science only initiative?

MR. DAVIES: At this time, it's a science initiative. There is consultation by Manitoba with each of the communities where the work is being conducted.

MR. McLACHLAN: Okay, thank you. Going forward, 1143. Here, 1143, and this is only for visual reference. I mean there's mention here acoustic tagging, it's my experience and experiences, you know, of other people, researchers in the north, that there is often community concerns around acoustic tagging and some of the other manipulative tools that we as scientists use. Can you speak to that a little

bit?

MS. SCHNEIDER-VIEIRA: You are quite correct, there are a lot of concerns with all of the First Nations with any kind of technique where basically you are catching fish, you're doing something, be it injecting hormones for spawn collection, be it putting in internal tags. Even there is a level of discomfort with just applying the little floyd tags or the little spaghetti tags because it's seen as being both potentially harmful and also disrespectful to the fish.

The early work that we did during the EIS in terms of both acoustic and radio tagging was done in the early 2000s. At that time, we tagged relatively few fish for that very reason. We tagged enough to demonstrate that, yes, fish can go upstream and downstream over Gull Rapids but we did not pursue it further because of the concerns of the communities with the internal tagging.

During the fish passage workshops which were held around, I was going to say 2008/2009, that would be subject to check, there were First Nations once again raised their concerns with the tagging but they also then began

to realize the importance of the data that could be collected through these tags. Before additional tagging or internal tagging was done, there were then further one-on-one meetings actually where Dr. Barth went actually to the Community of Fox Lake in particular to discuss with them how the tagging is done, why it's important, and get their input into the study design that is currently being conducted.

But yes you are right, there is a lot of concern with these kinds of internal tags. And we have worked very closely with the First Nations to get a better mutual understanding what's going on and to get their input into the studies which we hope increases their level of comfort with the work that's being done.

MR. McLACHLAN: As a follow-up to that, you described how early on you reduced the number perhaps of fish that you had actually tagged to accommodate those concerns. Are there other ways more recently that you changed your design or changed your methodology to accommodate concerns?

MS. SCHNEIDER-VIEIRA: What we did more recently is we have basically gone as indeed

I should mention that the biologists themselves also don't want to tag more fish than is required because we also recognize that you're catching a fish, you're implanting something. Yes, we feel that it's not having a long-term negative effect but you also want to be -- to not disrupt fish or the environment unnecessarily when you yourself are doing your studies.

But what we are doing now is we're working with the minimum number of tags that both DFO and Manitoba Conservation and Water Stewardship have indicated are acceptable for the different areas. And there is also, as I said, been the close work with the communities in terms of telling them what's going on. They actually are participating in the studies where the tags are being put on as well as discussing with them where things like the transmitters are being put into the environment. So there's that close work with the communities, or I should say with Fox Lake.

MR. McLACHLAN: You just spoke now about how you, a scientist, recognize that it can have adverse impacts in the short term in terms of a fish health. What about studies that have done

follow-up studies on tagged fish? Are there any data that show that there are differences in behaviour and mortality associated with tagged fish? And can you speak to those, please?

MS. SCHNEIDER-VIEIRA: With very limited exception, we have had no mortalities or immediate post tagging mortalities of tagged fish. I believe that there was one. The size of the tag that you put in is very important. If you put in -- basically if you want to tag that will continue to transmit over a longer period, you need to have a larger battery. And so it's the size of that battery and the additional information from having a longer term tag versus the size of the fish that's very important. Early on, we did some work where there was a tag that was inserted in the fish that was simply too large. We discovered that that didn't work. And we subsequently modified our methodology.

The trick is that apart from mortality, we don't know how non-tagged fish move in the environment. So we have seen tagged fish move widely. We don't think they are being negatively affected but I do recall that at one of the fish passage workshops, an elder took the

opposite view. She said well those fish are swimming all over the place because they are being disturbed by the tag. And she has a point. I can only say if the fish is healthy enough to swim around, but I don't know because there is no tagging data on how an untagged fish would be swimming in the environment.

MR. McLACHLAN: And in terms of other studies, you know, in terms of marked and recaptured studies of fish that have been tagged and ones that haven't, are there any data that indicate that they do suffer from differences in mortalities?

MS. SCHNEIDER-VIEIRA: We haven't seen any difference in where the tagged and non-tagged fish that were -- we haven't seen any clear evidence. But as I say, it's difficult because we don't know how the non-tagged fish are moving. We also don't see a huge difference between our floyd tagged and our acoustic tagged fish. And we have recaptured the acoustic tagged fish many times over time and we have also seen those acoustic tagged fish survive for a long time. We have even had some returns of acoustic tagged fish after the tag was no longer functional and they were caught

by a resource harvester and they returned that tag to us.

MR. DAVIES: For people that aren't familiar with floyd tags, they are a very small spaghetti like tag that's attached to the fish. They are not inserted like acoustic or radio tags.

MR. McLACHLAN: And so that's your experience. But is that also reflected in the larger literature?

MR. DAVIES: There have been some scientific studies that have shown, for example, that if a tag weighs less than 2.5 percent of the body weight of the fish, that there doesn't appear to be any impact on that fish.

MR. McLACHLAN: Perfect, thank you. Noah has a question for you related to the behaviour of the fish.

MR. MASSAN: Once you guys cut up to put that, I don't know what you guys put in that sturgeon, in their stomach there, why is that fish just hanging around that area? Like, for instance Kettle, Kettle dam there. I caught the sturgeon below the bay where the sturgeon used to be a long time ago. I caught that fish in gill nets. I caught one below that bay and one near that dam.

The one that's tagged, that sturgeon. And then it wasn't even healed too, it's kind of bruised up here. How long does it take for them to heal?

MS. SCHNEIDER-VIEIRA: Let me just check with the individuals who do the tagging. I was told, obviously we can't record in the wild how long it takes for them to heal up competely. You will continue to be able to see the incision.

Just like when a human has a cut. I should explain. There's an incision and that incision is actually stitched shut. So for any of you who have ever had a cut, you know you have a cut, it's stitched up, it heals, but you still can see the scar for a long time.

In terms of it not being -- in terms of what we know about how quickly it heals, there were just some fish that had internal tags put on them in a hatchery environment where we were keeping them and those were observed to be completely healed within a week.

MR. MASSAN: Okay. Next summer, if I catch it, I want to put him out of his misery if he's not healed. You know, that fish shouldn't suffer that if he's not healing. One of those first nations, our band was telling me they tied

that fish upstream and it ended up down there. And they told us he's not healing. You know, next summer when I set the nets in place there, if I catch it, you know, I would have kept it but I don't know if it's safe to eat.

MS. SCHNEIDER-VIEIRA: It would be very interesting to us if you do catch a sturgeon that has been, you know, that has one of those incisions, if you could note what the number is on the floyd tag because then that would really give us valuable information on saying yes, that sturgeon -- you know, this is when the acoustic tag was put in and this is what the incision looks like, however much longer after it's put in that you capture it.

We are aware of the two sturgeon that moved from Stephens Lake downstream into the -- downstream of Kettle, so they went past the generating station. And we know that they are still moving around. And so we know the last time we still had the transmitters in the environment, we'd know that they were still alive, but it would be interesting to know how well that incision has healed over time.

MR. MASSAN: What's in it for me? Why

should I do your studies? There's nothing in it for me, I'm just fishing.

MS. SCHNEIDER-VIEIRA: Well, Noah, as you know, if you do harvest the fish, you can get some money, a small payment for the tag return as information. We have to say from a scientific perspective, it's very -- we really appreciate it when people don't harvest the tagged fish because then they can continue to provide information to the studies. I suppose we would have to appeal to your interest in a better understanding of lake sturgeon in terms of if you choose whether or not to tell us what the fish is looking like when you catch it.

MR. McLACHLAN: I just wonder, and this is a question for you all, if this might be an example of how community members and fishers in this case can work with scientists in CAMP. And so bringing it back to CAMP, do you see these kinds of experiences as an opportunity for better monitoring information coming out when harvesters are working more closely with Hydro and more specifically the scientists involved in CAMP?

MR. DAVIES: I think that's correct. And as I had said previously, there was a very

large number of First Nation members that participated in the studies and that we develop very good relationships with those individuals. And a lot of information was shared both from our people to them and from their people to us. And the information was quite valuable. And we are getting information from people like Mr. Massan and others in the area.

MR. McLACHLAN: Perfect. Thank you. If we move ahead to 13-45. Here it talks about a temporary increase in phosphorous. Can you explain to me why there would be an increase in phosphorus?

MS. SCHNEIDER-VIEIRA: Can you please give us a slide number?

MR. McLACHLAN: 13-45.

THE CHAIRMAN: Thirteen in Dr. Vieira's presentation.

MR. McLACHLAN: Sorry, I'll always use the higher number from now on.

MS. SCHNEIDER-VIEIRA: Could you please repeat the question?

MR. McLACHLAN: So the question was, there's an observation here that there's a temporary increase in phosphorus and I'm just

wondering what the cause of that is.

MS. SCHNEIDER-VIEIRA: This was a study that was done after the Lake Winnipeg Regulation and Churchill River Diversion. And the thought was that that was related to the flooding as a result of the Churchill River Diversion. And that will be subject to check.

MR. McLACHLAN: So would you anticipate a similar -- first of all, is there a similar increase in terms of the water data that you have collected as it relates to Keeyask?

MS. SCHNEIDER-VIEIRA: First of all, let me just indicate that the authors of that study, it was a historic study, and they didn't attribute a specific cause to the increase in phosphorus.

In terms of the Keeyask project, we anticipate that there will be an increase in phosphorus in the flooded areas. As I stated in my presentation, because of the large volume of water moving down the main stem of the Nelson River and the limited mixing between the flooded area and the main stem, we don't expect the concentration of phosphorus to increase measurably in the main stem of the Nelson River.

MR. McLACHLAN: That said, I think we have heard observations that there had been increases in algae. Is that true?

MS. SCHNEIDER-VIEIRA: There are two different pathways by which algae can be affected. We indicated that in the flooded areas, you might see periodic algal blooms once the turbidity declines over time. And that would be related to the water not moving as much, being a little bit clearer and perhaps having elevated levels or somewhat elevated levels of phosphorus.

We also stated that because you are constructing the dam and some of the sediments are actually settling out of the water, you may have an increase in the incidents of algal blooms in the lower part of the reservoir and in the southern part of Stephens Lake in the area. We're not certain whether or not that will occur because the water is still moving relatively swiftly through that area so it just doesn't allow much time for algae to grow.

MR. McLACHLAN: I have heard that even in terms of your own studies, that there are algae kind of covering your nets that you are using to catch fish. Is that the case?

MS. SCHNEIDER-VIEIRA: Yes, that's the case.

MR. McLACHLAN: So is that consistent with experiences of fishers in the area as well?

MS. SCHNEIDER-VIEIRA: Yes, it is. I mean everyone speaks of the green slime.

MR. McLACHLAN: And so with that, you are saying you would anticipate that with impoundment of the water, a reduction in the flow, that you would anticipate that would continue to be a problem in the future?

MS. SCHNEIDER-VIEIRA: In terms of the green slime, or it's also -- the fancy algal name for it is periphyton, that's been reported for decades out of the system, even prior to any kind of development. I was going to say there's a note from the Fisheries people. Of course, it depends, you know, on how long you leave your net in how much slime it gets. I don't know that we would anticipate there to be a detectable difference for the fisher. You're getting the green slime now, you will continue to get the green slime. I don't know that the small difference we're expecting in the amount of algae would cause a detectible difference in the amount of slime that you're

getting in your net.

MR. MASSAN: That stuff you are talking about, back in '60s and '70s and '80s, there wasn't that much algae. Is that what you call it? There wasn't that much in them days. But I notice, I set my net out two weeks to catch fish. I got lots of that algae in my net, about a 300-foot net two days. Lots of that stuff. There's a big change. There seems to be lots of it now.

MS. SCHNEIDER-VIEIRA: Certainly when we looked at the -- well, there are a variety of sources that we used. The Split Lake PPER reported green slime. Each of the First Nation's reports indicated green slime. We have seen green slime. So it's interesting that you're saying that now this late in the fall, you are seeing a lot in a net and perhaps more than you have seen in other years. I can't speak to what is causing changes in the amount that you see over time. I have been told by people who fish, that it depends a lot on how long your net is in the water and where you set. And obviously what's been happening, you know, is the water still warm so the algae still can grow or has it cooled off?

And maybe right now, this is a very long warm fall and so that's why there's more now than you would normally see at this time of year. I can't say for sure.

MR. MASSAN: Yeah, because you see a lot of that stuff along the dykes too. Like saddle dam, dyke four, dyke six, along the shoreline. You see a lot of that stuff now. Before we didn't used to see that. There has been a big change along the shorelines.

MR. DAVIES: I'd just like to add one thing. For people that haven't set nets, one of the things that's quite annoying for the people that do set nets, including scientists, is when you pull that net up and it has the green slime on it, it takes a long time for it to get off. So that's one of reasons it's been brought up.

MR. MASSAN: I know there's no south shed nets there. And I see some, the 200 nets that were dumped there about a month ago I think. I said, "How come you guys are throwing these away?" "Too much algae," he said. "It costs too much to pay a guy to clean them." That's what the guy told me. So I don't know.

MR. DAVIES: I'll have to speak to

them about that.

MR. MASSAN: Because I picked some of those nets, I clean them myself. I just hang them on the tree and just shake the thing off, you know. Maybe I should have took pictures of them. I'm sorry I didn't. But they threw nets away and burnt them too.

MR. DAVIES: I will definitely speak to them about them.

MR. MASSAN: If you want to see nets, go to the Hydro compound. There's some hanging with algae right now. Two days ago I seen them. They didn't take them off the fence. You can give me them if you want to. I'll go clean them.

MR. McLACHLAN: So do you anticipate that kind of with the changes, that there will be, and this was spoken to by one of the other intervenors, that there will be changes in the type of green slime, you know, different algae species that will kind of grow to occupy the impounded water?

MS. SCHNEIDER-VIEIRA: In our analysis, we didn't anticipate there to be a change. In particular, it's important to remember that for -- there's a very large amount of flow in

the Nelson River. And just as we see in Stephens Lake, the areas that are off current are quite different from the areas along the main flow. And that main flow will go through the Keeyask reservoir and it will continue on through the southern part of Stephens Lake. So no, we're not anticipating there to be a big change in the kinds of algae. However, because sometimes people are not correct in their predictions, part of the monitoring program will be analysis of both chlorophyll A, which is the pigment that's in algae, to give a general amount, as well as we do collect periodic samples to look at the kinds of algae that are there because algae of course is a concern to people using the environment.

MR. McLACHLAN: And so when you look at past experience say with some of the proxy sites, there's no indication that those changes do occur in other comparable sites? Is that true?

MS. SCHNEIDER-VIEIRA: I'll have to check back on that. I am remembering that there was some work out of the Churchill River diversion. But I almost think that they found that the incidents of the blue/green algae actually decreased and I think that was because of

the increased flow through some of the lakes. But I'll need to get back to you on that.

MR. DAVIES: I'd just like to add one thing. I was being flippant when I was saying I will speak to our people about it, and I will, but one of the things that we do require when we are doing the tests, is we have to have good quality nets. If we're testing catch per unit effort, the number of fish that you catch per net, the nets have to be in good shape so that we can do comparisons between the different types of nets.

So if one of the nets is damaged and there's lots of holes in it and we set that and we compare it to a net that's new, we'll catch more fish in the net that's in better condition. So once a net reaches a certain point, it has less value in terms of providing comparative data between sites.

MR. McLACHLAN: Do you agree that this might be an opportunity to, say, share nets that are no longer of use for scientific studies but are of use to local fishers as an opportunity to spread good will?

MR. DAVIES: Absolutely. And I had mentioned earlier that one of the very young

summer students from TCN that worked for us in Winnipeg probably saw more gillnets than he ever wanted to see in his life. And that was one of the things he was doing actually.

THE CHAIRMAN: I think we're starting to stray a little off topic hear.

MR. McLACHLAN: Perfect, okay. I will move forward to page 27 I guess, and 59 in the lower number. Sorry, I guess 27 is the slide number and 59 is the lower number where it talks about construction effects. And so my question here is around fish salvage and what will happen to the fish in the cofferdams.

MS. SCHNEIDER-VIEIRA: A fish salvage is designed basically to maintain live fish. So typically you start off with short-term sets so you can catch the fish in good condition and move them. And generally, we would follow the conditions in our fish handling permit. But typically, you release them to the nearest water which in this case will be immediately downstream.

MR. MASSAN: I notice the last three dams I worked in, most of the Hydro people got a hold of those fish. Where were you guys again? Like when we pump the water out of the cofferdam,

all the fish go to that pump there. I noticed that when I was working night shift. There was nobody there. They grabbed the sturgeon, they didn't need the small jacks and whatever.

MS. SCHNEIDER-VIEIRA: The generating stations on the lower Nelson River did not have fish salvages done. The first time that I'm aware of that a fish salvage was done for a large hydroelectric project was at the Wuskwatim Generating Station. And there were over, from the lower cofferdam, I think we salvaged over 2,000 fish that were then transported downstream. Earlier stations such as Kettle, Long Spruce and Limestone did not have fish salvages that I'm aware of.

MR. McLACHLAN: And do those -- do any follow-up studies and monitoring indicate, say with Wuskwatim or otherwise other studies or other projects, that those fish suffer higher mortality or any adverse effects from being shifted in that way?

MS. SCHNEIDER-VIEIRA: There aren't any studies. Essentially what we want to do is capture the fish and move them as quickly as possible with as little handling as possible. So

I couldn't tell you how they survived. I did have a note though that for the Limestone Generating Station, there were some sturgeon that were salvaged and moved by Manitoba Conservation and Water Stewardship.

MR. MASSAN: Yeah. During the day only but what happened to the nights, night shifts? Because I seen some guys taking sturgeon there when I was working night shift near those pumps. You know, they are not there full 24 hours what I got to see.

MS. SCHNEIDER-VIEIRA: I am also aware of reports from both the Limestone -- well actually all three generating stations that sturgeon were harvested at the time the generation stations were conducted. And that was one of the potential reasons why the sturgeon numbers in those particular forebays decreased following impoundment, because the sturgeon were removed.

MR. McLACHLAN: And does your information indicate that it was primarily Hydro employees that were taking those?

THE CHAIRMAN: That's not relevant.

MR. McLACHLAN: I would just add -- okay, let me change that. So when we look at the

current situation, are you taking steps to prevent that from happening?

MS. SCHNEIDER-VIEIRA: Yes.

MR. McLACHLAN: What would those steps be?

MS. SCHNEIDER-VIEIRA: People will not be allowed to harvest fish at the project site and that is within the actual construction area there won't be any harvest permitted.

MR. McLACHLAN: Thank you. If we can move forward now to page 23 or 55, or I guess it's backwards to 23 or 55.

THE CHAIRMAN: Dr. McLachlan, I'm just looking to taking a morning break. Will you be much longer?

MR. McLACHLAN: I'm about halfway through, so would it be a good time to take a break now?

THE CHAIRMAN: Yes, I think it would be. We'll break for 15 minutes.

(Proceedings recessed at 11:00 a.m. and reconvened at 11:15 a.m.)

THE CHAIRMAN: We will reconvene now, please?

Okay. I would hope that we can

conclude this segment by the time of our noon break, and that would include a number of questions from the panel.

Dr. McLachlan, I would ask you to not stray too far from the materials that were presented by this panel yesterday.

MR. McLACHLAN: Sorry, about that, I will try and remain a little bit more focused.

So I have a series of questions around non-indigenous and invasive species. So for visual reference, I guess the same page, 2355, down at the bottom talks about rainbow smelt. We heard a little bit earlier about common carp. And so I guess what I'm asking is, how has the rainbow smelt affected the forage fish community?

MS. SCHNEIDER-VIEIRA: The rainbow smelt have become one of the most abundant forage fish species. And we haven't seen any enormous change in sort of the other species. When rainbow smelt first came in, we were concerned, basically what has been seen in other places, for example, Ontario, is they add another level to the food chain so that species such as walleye would have higher mercury levels. We have not seen that. And the other thing which has been seen in some

lakes is that when you have rainbow smelt, that the lake whitefish disappear. And also we haven't seen that. So two of the effects that we were most concerned with have not occurred.

MR. McLACHLAN: Do we know how they were introduced?

MS. SCHNEIDER-VIEIRA: I am sorry?

MR. McLACHLAN: Do we know how they were introduced, the rainbow smelt?

MS. SCHNEIDER-VIEIRA: The rainbow smelt have been spreading through the system. They were observed in Lake Winnipeg first, and then going down the Nelson River. So I think they have just been following the natural watershed.

MR. McLACHLAN: Thank you.

Do we anticipate that their presence will be affected, one way or another, either by the construction or the operation of the dam?

MS. SCHNEIDER-VIEIRA: That is one of the questions that we looked at. Currently, they are actually somewhat more abundant in Gull Lake than in Stephens Lake. Technically you would expect that in a reservoir they would be more abundant, but certainly at present that doesn't seem to be the case.

MR. McLACHLAN: But you would anticipate then that with the impoundment of the water, that they will increase in the newly created reservoir?

MS. SCHNEIDER-VIEIRA: You would think they would increase in the reservoir. As I mentioned, in the reservoir that we have, they have not. They are not more abundant than in Gull Lake. So it is one thing that will be open to monitoring.

MR. McLACHLAN: Why would you have anticipated it would increase?

MS. SCHNEIDER-VIEIRA: Because they are more common in lake environments than in river environments.

MR. McLACHLAN: I have a question around the implications of, first of all, the construction and then the operation of the dam for indigenous species.

So when you look at proxy studies and when you look at, you know, previous experience, do you anticipate, first of all, with the construction of the dam that there will be any changes in either the benthic invertebrates or fish that are non-indigenous?

MS. SCHNEIDER-VIEIRA: In terms of invasive species?

MR. McLACHLAN: Invasive or otherwise.

MS. SCHNEIDER-VIEIRA: The spiny water flea has recently been recorded from Lake Winnipeg, as well as the upper portions of the Nelson River. And at the request of Manitoba Conservation and Water Stewardship, we did start a surveillance program for that species. I can't say whether it would be more or less abundant in a reservoir environment. To date, what has been noted in the Winnipeg River, for example, so we are basically just going to monitor for it. That was just a very recent addition within the last year.

In terms of rainbow smelt, we have already discussed. And finally carp were brought up, and we don't have any information that carp would become more abundant simply as a result of the construction of the Keeyask project. Though, as we, I think discussed when we talked about carp yesterday, because over time if the water becomes warmer as a result of climate change, over time you expect southern species to shift their distribution in a northward direction.

MR. McLACHLAN: Is it true that for invasive species that prefer warmer water, that they will tend to be found in greater numbers in those reservoirs?

MS. SCHNEIDER-VIEIRA: The reservoir itself will not have an effect on the water temperature. These reservoirs are stratified and don't change the water temperature. So the invasive species will do what they will as a result of regional changes, if you will, province-wide changes, global changes, but we haven't identified any that we think would do markedly better or worse with a reservoir.

MR. McLACHLAN: Perfect, thank you.

If we go to 39 and 71, so kind of -- so page 39 or 71, depending on what you are looking at. And then the following page as well, in terms of mercury effects, and then the previous page. So those three pages all have to deal with methylmercury concentration. I guess, first of all, looking at the graph, we see that decline that you had anticipated. But the high point seems in, I guess 1982 or something, '83, to be greater than 1.6. And yet you talk in terms of model predictions that mercury concentrations will

only reach about one part per million. Can you explain why those would be different?

MS. SCHNEIDER-VIEIRA: In Stephens Lake there were 220 hectares that were flooded. And so compared to the pre-existing area of water, there was a much greater percentage of flooding than in the Keeyask reservoir, where it will be basically 50 per cent flooding and 50 per cent existing.

MR. McLACHLAN: I guess this a question, pardon my ignorance, for the Chair, will we be talking about human health impacts of methylmercury through another panel?

THE CHAIRMAN: I believe that will be before the -- I think it is the fourth panel.

MR. DAVIES: It is the next panel.

MR. McLACHLAN: So the socio-economic, okay. Perfect, thank you, I will hold off on that.

Do you anticipate that there will be any other changes in the concentrations of other heavy metals associated with the dam?

MS. SCHNEIDER-VIEIRA: In the water quality section, there is a description of changes to metal levels in the water, and there are a

variety of metals that will increase following flooding. As with the other parameters that we have discussed, we don't expect there to be a detectable change in the main flow of the Nelson River.

MR. McLACHLAN: I know other studies, for example, have found that wildlife and fish have high cadmium levels. Would you anticipate that with the increased exposure of, you know, the mineral air and rock that that will increase?

MS. SCHNEIDER-VIEIRA: No, there is actually a section in the EIS, which I can reference you to if you like, but when we examined, the other metals that will increase do not bio accumulate in fish, so we don't expect there to be increases.

MR. McLACHLAN: So cadmium you are saying doesn't bio accumulate in fish?

MS. SCHNEIDER-VIEIRA: We are not expecting increases in cadmium, no.

If you are interested, that is described in the IR CAC 22B.

MR. McLACHLAN: Perfect, thank you.

Now, as part of the monitoring you will obviously be taking kind of samples of fish

in the future, to see if there are any unanticipated changes in heavy metals?

MS. SCHNEIDER-VIEIRA: We will be monitoring for mercury. At present there is no monitoring for other heavy metals planned. If in its review of the program, either the Department of Fisheries and Oceans or Manitoba Conservation and Water Stewardship request that this be added, then it would be added.

MR. McLACHLAN: But you were saying that you haven't seen any, or you don't anticipate any increases in the other heavy metals, but you are not monitoring the fish to, I gather from what you just said, to see if those changes are occurring? Is that based on past data then?

MS. SCHNEIDER-VIEIRA: It is based on experience from other hydroelectric developments. Other heavy metals just haven't been an issue elsewhere. So when you are determining what you are going to monitor, you do look at experience from other water bodies and other developments.

MR. McLACHLAN: In Manitoba, but certainly it is my experience that in other parts of Canada we have seen increases in, say, cadmium levels in Northern Alberta that might be

attributed to hydroelectric development. But you are saying that would be different here because the raw conditions are different?

MS. SCHNEIDER-VIEIRA: I'm certainly not aware of studies that have indicated increases in cadmium as a result of hydroelectric -- increases of cadmium in fish as a result of hydroelectric developments. I have seen it in terms of concerns with mines, and also air emissions from mines and smelting operations.

MR. McLACHLAN: Would you anticipate there would be any polycyclic aromatic hydrocarbons generated through the construction phase of the dam?

MS. SCHNEIDER-VIEIRA: We don't anticipate -- well, that type of substance could be introduced through an accidental spill. There is a spill management plan that has -- it is basically to address spills.

MR. DAVIES: I would just like to add to that that the most sensitive test that I know of for hydrocarbons in fish is actually taste. The very, very small percentages of hydrocarbons in fish will be tasted by people, and then, of course, we would be advised of that.

MR. McLACHLAN: So as part of your monitoring, if there was an accidental spill that was known or otherwise, if people experience changes in the taste of the fish, would you then incorporate that into your monitoring program and testing to see --

MS. SCHNEIDER-VIEIRA: I anticipate that if there is, for example, an accidental spill, that the monitoring would be adjusted accordingly to address the environmental effects of that spill, and I should add, if it is a spill where it is expected that there was a release to the water. If there is a spill that is contained at a fueling area, for example, and there is no risk of release to the water environment, we won't be modifying our aquatic monitoring program.

MR. McLACHLAN: Thank you.

But hypothetically, say if people were noticing differences in the taste of the fish that were consistent with that kind of contamination having taken place, is there a flexibility enough within your monitoring to accommodate that and to do the testing, even if there was no evidence of a spill in terms of your own records?

MS. SCHNEIDER-VIEIRA: Yes, there

certainly is. And in the very last panel of this series from the Partnership, you will hear about the environmental, I was going to say the overall environmental monitoring program, as well as the monitoring advisory committee, which is a joint committee of all of the partners. And that is where we would expect concerns such as this to be raised, such that both the technical and Aboriginal traditional knowledge programs could be modified to address such concerns.

MR. McLACHLAN: Thank you.

Just as a point of clarification, I guess, in page 2153, so either 21 or 53, in terms of operation effects, down at the bottom associated with the Long Rapids, you talk about habitat essentially unchanged.

MS. SCHNEIDER-VIEIRA: Yes.

MR. McLACHLAN: What do you mean by essentially unchanged?

MS. SCHNEIDER-VIEIRA: There is a very small increase in the water levels as a result of impound that extended just downstream of Long Rapids. And so technically you would say, yes, the water levels have gone up 10 centimetres, so yes, your habitat changed. But in terms of the

characteristics that are important to aquatic biota, that would not affect it.

In addition there is, as was discussed by previous panels, there is that very small effect during some -- I was going to say some years of low flows there will be a larger ice dam, so, yes, there would be a small increase in water levels when they would normally be lower. Once, again, that is, technically that is a change but it is not a change that's going to affect your aquatic biota.

MR. McLACHLAN: Thank you.

In the paper that was brought forth yesterday and entered into evidence, DFO signs advisory report around the COSEWIC. As part of the tables, the first table that was presented there, they identified a series of different stressors. And they indicated there that domestic fisheries or subsistence fisheries contribute to decline of sturgeon. And I think you also perhaps, kind of when you were presenting, also implied that the local fishing had contributed to the decline. Can you speak to that in a little bit more detail?

MS. SCHNEIDER-VIEIRA: Well, I will

start, and then Ms. Matkowski can add if she has additional information.

What I emphasized was that when we are dealing with extremely low populations like, for example, in the Gull Lake area where we are talking several hundred fish, even a small domestic fishery of maybe 50 fish, or 60 fish, or 30 fish, which in an un-impacted population would not affect that population, because these populations have been reduced by so many other factors, in particular the commercial fishery, that even a very small domestic fishing effort can have an adverse effect.

We also actually saw that in the 1990s. At the Landing River there was a population of sturgeon that were still spawning there, and as a result of continuing domestic fishing, once again not at excessive rates, that population was virtually extirpated. And that was one of the big impetuses for starting the Nelson River Sturgeon Board.

MR. McLACHLAN: Go on.

MS. MATKOWSKI: Yes, I would add that that paper that was entered does indicate that the magnitude of things like, the impact of things

like domestic fishing varies from management unit to management unit. And the table that you mentioned indicates that for the particular management unit between Kelsey and Kettle Generating Station, they have assessed the occurrence of domestic and subsistence fishing as being high, and that the level of severity of the threat also being high for that particular management unit. It is not the same in all of the sections of the Nelson River, but for that section it is in this report high.

MR. McLACHLAN: But, again, you would attribute that to the low numbers of the population?

MS. SCHNEIDER-VIEIRA: Yes, it is always the proportion of fish that are taken.

MR. McLACHLAN: Is that something that is monitored with the communities in terms of the actual numbers of the fish that are harvested?

MS. SCHNEIDER-VIEIRA: The communities can provide us with harvest information if they wish. The aspects of the Aboriginal traditional knowledge monitoring programs are still being developed. And certainly, as I have mentioned previously, the communities conducted their own

ATK work. In that work they chose not to provide quantitative estimates of the amount of sturgeon that were taken. We have some information of sturgeon harvest, both from what people have told us, as well as when we get tag returns we can calculate a percentage of harvest.

MR. McLACHLAN: And as we've heard today, there may be also other sources of domestic fishing, in the case of Hydro employees perhaps fishing or collecting fish. So you will be monitoring that if indeed it does take place, right?

MS. SCHNEIDER-VIEIRA: Certainly at the construction site, harvest will not be allowed. Because it is just, within the construction site there is also safety concerns, but that is something that the Partnership can regulate. In terms of domestic harvest of sturgeon that occurs in other areas, that is not something that the Partnership can regulate. And in terms of the monitoring for that, it would only occur to the extent that resource harvesters choose to report their harvests.

MR. DAVIES: I would just like to add that there won't be any personal boats allowed by

the site, which will make it much more difficult to access areas where they would be able to harvest sturgeon.

MR. McLACHLAN: Thank you.

MS. MASSAN: What about right now, that camp off 280 road? You see a lot of Hydro vehicles. One time I went by, there was four Hydro vehicles parked at that north, you know, the cement bridge when you come to 280, they were fishing there. How come they get -- I don't know, some people tell me this -- why are they using Hydro vehicles to go fishing?

MR. DAVIES: I'm not aware that that occurred.

MR. MASSAN: Nobody is monitoring that. Maybe they will be doing that at the Nelson, but they don't do that along that 280 road. Like I see that when the pickerel is running, I see four Hydro vehicles are sitting there on the bridge, and those guys are fishing there. You know, nobody watches that.

MR. DAVIES: Again, that's something I wasn't aware of, but I appreciate you making a point of that, and I'm sure that Manitoba Hydro will look into it.

MR. McLACHLAN: So, then that was my follow-up question, you will adapt the monitoring and the management to accommodate those kinds of offsite fishing excursions?

MR. DAVIES: If those type of things occur, yes, we would.

MR. McLACHLAN: Page 92, I will go with the high numbers I guess.

Are the Gull Rapids considered historic sturgeon spawning areas, either according to Manitoba Hydro data or ATK?

MS. SCHNEIDER-VIEIRA: I am sorry, do you mean this slide? Just from your reference I understood a different slide, do you mean this one?

MR. McLACHLAN: Or whichever makes sense, it doesn't matter. It would be, I guess it would be a different -- whichever the slide is that reflects spawning.

MS. SCHNEIDER-VIEIRA: Okay.

And could you repeat your question, please?

MR. McLACHLAN: So the question was, are they considered, the Gull Rapids, are they considered to be historic sturgeon spawning areas

according to data from either Manitoba Hydro or according to ATK?

MS. SCHNEIDER-VIEIRA: Gull Rapids has been identified as a spawning area, both from observations during the EIS studies, as well as from the community's reports.

MR. McLACHLAN: Okay, thank you.

I guess now that we are looking at that slide in terms of the populations in the study area, you have three kinds in the legend, you have known spawning locations, spawning known to occur in the general area, can you tell me what the difference is between those two?

MS. SCHNEIDER-VIEIRA: Yes. The known spawning location, which is First Rapids on the Burntwood River, was based on obtaining basically drifting larval sturgeon immediately downstream of that area. So it is a fairly restricted place.

The spawning known to occur in the general areas basically highlighted the entire rapids, because from the capture of fish in spawning condition within the vicinity of those rapids, we knew that they were spawning somewhere, but say, yes, they were spawning the left bank or the right bank or wherever, it wasn't that

specific. And finding the suspected spawning locations, which we discussed this morning, is because we have caught very limited numbers of fish. As I say, I believe there was one from the Grass River, as well as two from downstream of the Kelsey Generating Station, including one just this past year, it looked like, yes, there is a female in spawning condition. But there were really not enough fish caught there that we could say, yes, they are definitely spawning at these locations.

MR. McLACHLAN: So does that information incorporate ATK as well, or is it solely based on your own sampling?

MS. SCHNEIDER-VIEIRA: This map incorporates our own sampling. However, from the ATK we have not heard of other spawning locations, besides the ones that are illustrated on this map, in this particular reach of the river.

MR. MASSAN: You talk about sturgeon and walleye and pike. How come the other species don't come in, like burbet, what happened to the goldeyes, whatever you call those little fish? Before there used to be lots. What happened to them? Even trout, before Kettle dam?

MS. SCHNEIDER-VIEIRA: In the EIS we

did sample and we did talk about what we call the entire fish community, that is all of the species that you just mentioned. And we talked in general terms about how they have changed over time, and what we expect would happen in the future. But we had to focus our work on a few key species, because otherwise, I mean, we already have a stack of documents that's very high. And we didn't -- basically, you just can't provide information on each -- detailed information on each of the 37 species. You need to be able to focus your work so you can focus your attention on the species that are of the greatest concern.

As I talked about in my presentation yesterday, looking at these different species that use different kinds of habitat as the VECs, looking at sturgeon, which are dependent on the river, pike that are, you know, working along the shoreline areas, as well as lake whitefish and walleye which are using the main part of the lake, that helps us understand what is happening more in the environment as a whole, and that is one of the reasons we picked those species. The other reason is that those are species that are the biggest concern to many of the local First Nations.

MR. MASSAN: There was no studies done before Kettle Dam, because when I was growing up listening to the elders, I learned a lot off those elders when they talk about the river. And I seen a few places in that, from Kettle to Gull Rapids, where the sturgeon were spawning. Because I remember one old man, Dallius, it was Dallius Ouskun, he told me look at the little fish, I thought they were minnows. But they were a bunch of little sturgeon, right on that island they call Turtle Island. I don't know where that name come from. It is all Manitoba Hydro naming these islands now. That old man was saying -- that environment here in Gillam, you know, why don't you just call it Kettle reservoir instead of a fancy name, Stephens Lake? You know, it is a reservoir only, that's all it is, not a lake. Kettle is holding all that water back. And same thing will happen to Gull Rapids, you know, they should just call it Gull Rapids reservoir, what is the fancy name, Kettle Lake and all of that?

There is another thing about fish, what is going to happen to those minnows, where the cofferdam is going to be, there is a lot of minnows back in the '60s, '70s and '80s. I notice

every year there is hardly any around that area because of that green stuff, I think, I'm not sure. Like I'm not a scientist, I just see --

MS. SCHNEIDER-VIEIRA: In terms of the fish salvage, I would have to check back into how small the fish that we did the salvage on, how far down we went in terms of the size of the fish for the Wuskwatim project, and I will get back to you.

You are correct that the smallest minnows, it is practically not feasible to scoop up every minnow and release it. Because of the way the station is being built, I'm sorry, the timing of when in-stream construction will occur, there was an attempt, for example, to not close off parts of the river in spring when fish could be gathering at Gull Rapids to spawn, so there will be fewer fish that will be potentially enclosed with the cofferdams and have to be salvaged. So there's both the fish salvage as well as the timing of construction that will help reduce the number of fish that are trapped by the cofferdams.

MR. McLACHLAN: So, hypothetically if there were sturgeon fingerlings, or tiny fish that were caught in the cofferdams, there would be no

way of transporting those either?

MS. SCHNEIDER-VIEIRA: When the in-stream construction in Gull Rapids will happen -- or they will be sealing off different parts of Gull Rapids through the late summer and into the fall, and at that time of the year there are not spawning sturgeon in the rapids. Any sturgeon that do spawn will spawn in the spring and then their eggs would hatch, and those larval fish don't stay in the rapids, they come up out of the substrate and they drift downstream. So because of the timing of the construction, there won't be little sturgeon in the rapids.

MR. McLACHLAN: Thank you.

Page 75 or 107, and it talks about upstream fish passage.

So we heard from you yesterday about the multi-million dollar cost of the fish ladder and why, when presented to the community, it kind of, in the context of uncertain results, there was a kind of recognition that perhaps it would cost a lot, perhaps too much by some of the people participating in those workshops. But you also, here you talk about other methods, trap and transport and nature like bypass channels. Are

those viable alternatives?

MS. SCHNEIDER-VIEIRA: They are all viable alternatives, and they all come with a substantial price tag. And as I discussed yesterday, which, and if fish passage will be implemented will be decided not just by the Partnership or Manitoba Hydro, but with input from both the Department of Fisheries and Oceans, and Manitoba Conservation and Water Stewardship. And they will be looking at what they feel is required to support the fish populations.

And so it won't -- the result wouldn't be, I guess it looks like really you should have fish passage, but it is not going to be built because it is too expensive. If it looks as if fish passage is required to maintain the populations, which we are not predicting, but if that does occur, then some method of fish passage would be installed.

MR. McLACHLAN: In terms of your own experience as an expert, or others in the panel, can you critically comment on the potential of those other two solutions that are lower in cost perhaps than the fish ladder, as a way of mitigating against mortality?

MS. SCHNEIDER-VIEIRA: My understanding is that actually the costs of those three, there are fish ladders which cost more or less; trap and transport can be quite expensive just because you are building a collection facility and then there is higher operating costs. So you shouldn't look at that as a decrease in costs, they are all costly. And it is not like a fish ladder costs more than the other methods.

In terms of what would work, it really depends on what your objective is. If your objective is that you absolutely want to take a sturgeon from Stephens Lake and transport it up to the Keeyask reservoir, then your best method would be basically to catch that sturgeon and move it. If your objective might be, well, let's leave the fish do whatever they might want to do and not worry about whether any fish ever goes, but let's create some fish habitat, something like a nature like channel might be a best method. If you want to sort of have a hybrid between the two, or if you want to look at other methods, or other areas where at least sturgeon species have been observed to move, then you might want to look at a fish ladder. So it really depends on what your actual

objective is in installing fish passage.

MR. McLACHLAN: Thank you.

In terms of those workshops when you presented those different alternatives, was there any difference in response on the part of those participating in terms of which they felt would sit best with them?

MS. SCHNEIDER-VIEIRA: I don't recall one method being universally more or less favoured than the others. It was really at the fish passage workshops there was not a clear consensus, it wasn't like yes, we definitely want fish passage, and we want it to be done in this way, it was more like this is a concern and we are seeing that there isn't a very good clear solution for that concern.

MR. McLACHLAN: Do you agree, for example, with the trap and transport that there may be other benefits, for example, employment to local youth or perhaps other locals that might be involved in such an initiative?

MS. SCHNEIDER-VIEIRA: We focused our work on fish so I can't speak to other benefits.

MR. McLACHLAN: Thank you. You mentioned that should this be recommended by DFO

and other agencies, that the cost would be shared by the Partnership. And so do you anticipate that that would create kind of financial burdens for the First Nations that are involved?

MS. SCHNEIDER-VIEIRA: That's also a question which I can't speak to. I'm not aware of the economic considerations in the Partnership.

MR. McLACHLAN: Thank you. On page 108, so the next page.

MS. SCHNEIDER-VIEIRA: I didn't catch your slide number?

MR. McLACHLAN: 108, so the next page.

THE CHAIRMAN: 76.

MR. McLACHLAN: 76, 108, yes. So downstream fish passage talks about that there is mortality associated with and injury associated with the turbines. Do you have a sense of the relative numbers of fish that might either be injured or especially killed by the turbines compared to -- and here we are talking about sturgeon -- compared to those associated with the domestic fishing?

MS. SCHNEIDER-VIEIRA: If we look at the current number of sturgeon moving downstream from Gull Lake, it is less than 2 per cent of the

total number in the lake. And I'm just trying to remember, I think over the past year or two, we had one or two sturgeon that moved downstream. And we, as we've discussed, whether the sturgeon goes through the turbines or whether it goes over the spillway and whether or not it is killed is also not certain. But certainly in our current estimates of harvest, the estimate of harvest is higher than one or two sturgeon from Gull Lake. However, post project, the First Nations have indicated that they don't want to harvest within reservoirs, at least for other fish species, so the amount of harvest from Gull Lake or the Keeyask reservoir in the future, may also decline. There will also be work with the First Nations via in part through the lower Nelson River Sturgeon Stewardship Committee, spreading the information that the sturgeon in this area are vulnerable and that it would be better for the populations not to harvest them.

MR. McLACHLAN: And when you look at the data for other fish species, you know, that are harvested by community members, do you -- are the mortality kind of numbers comparable to the subsistence harvesting numbers?

MS. SCHNEIDER-VIEIRA: Once again it sounds like I'm avoiding the question, but it depends on what the domestic harvest is. For the information that we have received from the First Nations is that the main stem of the Nelson River is not a preferred harvest location because the fish have a poor taste and quality. But we do know that there is some harvest for the First Nations in terms of the post-project due to the elevated mercury levels for several decades. Programs have been put in place where they will be obtaining fish from off-system, from areas outside of the Keeyask reservoir. And so post-project we would anticipate that the level of domestic harvest will decline, and so then obviously the amount of mortality associated with turbines would be higher. In the existing environment I don't have an estimate of the amount of domestic harvest, so I can't do a direct comparison. However based on the work that we've done and predicting over 90 per cent of survival of the majority of fish that would be going downstream, as well as the number of fish in the relative size of the lakes and the small proportion of fish that we expect to go downstream, we don't expect there

to be a detectable effect to the populations.

MR. McLACHLAN: Thank you. If we move to page 83, or 115, I appreciate there have been a number of questions that have focused on the part of intervenors on the stocking programs and on the habitat creation, but I have a few more. It says here at the bottom of that that an overall increase in sturgeon numbers in the Kelsey to Kettle region is expected due to stocking. And we heard you defend that. It seems like it is predicated on two main components, as you indicated yesterday, the first creation of new habitat, especially for young-of-the-year, so I have questions around that. You also indicated it hasn't been done before, so this was highly innovative and that's great to see. But would you agree that when you are initiating habitat creation of this sort that's never been done before, that there are higher risks involved?

MS. SCHNEIDER-VIEIRA: Yes, you are correct, that there are higher risks involved when you are trying something new. I should also, and I probably didn't stress it sufficiently yesterday, in the assessment of potential effects to the young-of-the-year sturgeon, we were being

very conservative in that we were basing our assumption on that they would use only a very specific kind of sand habitat. And that's based on both our observations in the Gull Lake area as well as some work done by other researchers. However, there is also other work done, and even in our examinations of sturgeon, young sturgeon in Stephens Lake, we do see that they potentially could use a wider variety of substrates. For example, in Stephens Lake we found them on some gravels, and in some of the work from the Winnipeg River they were found on fine silts. So we are being very conservative in our assessment of what is suitable for them because we felt that was appropriate. But it is possible that through monitoring that we find that, yes, indeed either there are pockets of sand or that they are able to use a wider range of habitats. Now moving on to your question about habitat creation, it is something that is -- that we would be testing, if required, and you are correct that it is an experimental approach. Our big advantage, or what gives us time and increased confidence for this project is that we know that we can support our sturgeon populations through stocking, even if it

takes us some years to get this young-of-the-year habitat working well. We can also stock yearling fish which don't require young-of-the-year habitat.

So it is almost like we have this backup plan that allows us the luxury of having multiple years to sort out, if we need young-of-the-year habitat, and if we do, we can install it by either sand, and if we find it is not in the right location or whatever, we do have the opportunity to maintain our sturgeon population through stocking until we can get the young-of-the-year habitat functioning effectively.

Taking one step back, the increase in sturgeon numbers is actually predicated upon the success of stocking to enhance the populations in the upper Split Lake area, because there we do have demonstrated sturgeon habitat, we have historic records of more sturgeon, and we know that's an area where the habitat is not being affected by Keeyask. So regardless of what is happening down the Keeyask reach, we do have this large area where there would be more sturgeon, if that population is supplemented through stocking.

MR. McLACHLAN: Thank you for that.

Now hypothetically, if that innovative program doesn't work at all after monitoring and experimentation, would you see yourself in a position that you just abandon it with a more conventional spawning habitat?

MS. SCHNEIDER-VIEIRA: I am sorry, the spawning habitat that we are creating is based on work that's been done in other places that has worked successfully, it is the young-of-the-year habitat that has not been created elsewhere. And no, we would continue to work -- if we are finding that young-of-the-year aren't successfully recruiting in the reservoir, there is a long term commitment to continue to work to find ways of creating that appropriate environment for those fish.

MR. DAVIES: I would also like to add that we are working with B.C. Hydro and Wisconsin on young-of-the-year habitat, and any information that would be gained that would be useful for this project would also be transferred.

MR. McLACHLAN: So you are saying in those other regions that they have embarked on similar kinds of young-of-the-year habitat experimentation?

MR. DAVIES: They are currently looking for young-of-the-year habitat.

MR. McLACHLAN: But to your knowledge are there any other agencies that are, or actors that are embarking on similar kinds of experimentation?

MS. SCHNEIDER-VIEIRA: Not agencies that are attempting to create young-of-the-year habitat.

MR. McLACHLAN: Obviously you are in conversation with experts that work in those other agencies. What, if any, feedback have you got from them on the potential success or even kind of appropriateness of this strategy?

MS. SCHNEIDER-VIEIRA: In some ways the work that we have done here on young-of-the-year both in capturing them in the large river environments, as well as the proposed habitat requirements are at the forefront of research on young-of-the-year sturgeon. As Mr. Davies mentioned, some experts from our office are actually going out to other places to assist them in the work on young-of-the-year.

MR. McLACHLAN: So, for a second assuming in a very gloomy way that this was a

complete failure, you know, hypothesizing that, could you find yourself in a situation that in 25 years time, or 75 years time you are still dependent on stocking as a way of maintaining those sturgeon populations?

MS. SCHNEIDER-VIEIRA: I was going to say that I personally won't be here in 75 years, just by point of clarification. But yes, I suppose that if all attempts failed, that we would expect that, yes, you would need to continue to stock. Because of the diversity of reservoir environments where we do find sturgeon, I'm quite confident that there are ways that you can continue to keep sturgeon in the Keeyask reservoir.

MR. McLACHLAN: So pardon my ignorance, but when you are looking at this innovative program, how quickly can you generate data that indicate whether it is being successful or not? I mean, surely we are not talking about 25 or 50 years but --

MS. SCHNEIDER-VIEIRA: Our first challenge will be that, and I have to say that when we first generated this, our work, we weren't aware of how low the natural rate of recruitment

was from Gull Lake. Currently we have only found successful recruitment one in ten years. So we would hate to have to wait until some sturgeon may spawn again every ten years to see whether or not there is successful young-of-the-year habitat. So if in our continued recruitment monitoring we are really finding that the natural recruitment is very low, we would be looking at other approaches. For example, in our stocking program, we could stock quite young fish into the area where we believe that they should go, and through subsequent monitoring we could determine whether those fish survive. Because due to the low natural rate of recruitment, it might be very difficult, or it is not something that we would want to rely on in terms of a reasonable duration of determining whether or not the habitat is available.

MR. McLACHLAN: Thank you. When we talk about these different sub populations that are reflected in the sturgeon numbers, did you indicate that there is any genetic variation among those sub populations, or is it just sort of an ad hoc sub population, or how would you define those populations?

MS. SCHNEIDER-VIEIRA: We had initially defined them based on movement, and then with the subsequent genetic studies which I showed in my presentation demonstrated that there is a genetic difference amongst the -- the Kelsey, Burntwood is genetically different from the Gull Lake area. We did not in that genetic analysis have material from the Stephens Lake area, that we are currently doing a more refined genetic analysis which includes samples from young fish at Stephens Lake, so that would be post hydro. And we are interested to see whether they are different from Gull Lake or if indeed they are young sturgeon that drifted down the stream, over Gull Rapids from the Gull Lake spawning population, since we know there are very, very few spawners in Stephens Lake.

MR. McLACHLAN: And you may have addressed this with the last intervener, but when you -- in the advent that there is genetic variation in the Stephens Lake population, and given the low numbers, if you are restocking those, is there a danger that you will get homogenization?

MS. SCHNEIDER-VIEIRA: We will

definitely be using Gull Lake fish for Stephens Lake. There just aren't enough in Stephens Lake. But as I mentioned, they may well be the same fish. We will determine -- that information will come in an upcoming genetic analysis where we are doing more -- basically it is a higher level of precision to look if there are further subdivisions amongst these populations.

MR. McLACHLAN: And should that actually occur, do you see that as a problem, if you get genetic homogenization?

THE CHAIRMAN: That was covered earlier.

MR. McLACHLAN: Thank you, Mr. Chair. I just have a few more questions. One more is the use of stream side rearing facilities, and I think you indicated earlier that most of your stock is going to come from Grand Rapids?

MS. SCHNEIDER-VIEIRA: The Nelson River Study Board has used both Grand Rapids and I believe they have tested some stream side rearing facilities. The current plan is to use Grand Rapids, but there is also the potential to use stream side facilities. And I will just look to Shelly if she wants to add?

MS. MATKOWSKI: There definitely is the potential to use stream side facilities, and right now we are using Grand Rapids for the Nelson River Sturgeon Board. And as I understand it, during construction of Keeyask we will be using Grand Rapids hatchery.

MR. McLACHLAN: And so do you anticipate that you might use both approaches, and what would you see as being the benefits of using each?

MS. MATKOWSKI: There is definitely an option of using each. And there are pros and cons in using each. Stream side you don't have to worry about moving eggs. You've got the same water that the eggs -- that the fish have come from that you are going to be incubating the eggs in. The problems that you can have are lack of control of temperature, lack of control of silt in that water, those sorts of things.

MR. McLACHLAN: But you see them as complimentary approaches?

THE CHAIRMAN: That's been answered.

MS. MATKOWSKI: They could be complimentary.

MR. McLACHLAN: That's all I have. Do

you have any final questions, Noah? No, perfect.

THE CHAIRMAN: Thank you both very much. The panelists have a number of questions, and perhaps we will just run down the table, Mr. Shaw?

MR. SHAW: Dr. Schneider, just following up on some of the questions that Dr. McLachlan asked you about, sort of the level of determination of the Partnership in terms of developing a self-sustaining population of sturgeon; is the Partnership committed to stocking and/or other compensation measures until a self-sustaining population is established sort of regardless of the number of years it would take?

MS. SCHNEIDER-VIEIRA: Yes, that was stated in the environmental impact statement, and that is a commitment that the Partnership has made.

MR. SHAW: Thank you. And one other question. Have you studied the status of fish populations in water bodies where the offsetting programs in the adverse effects agreements are proposed?

MS. SCHNEIDER-VIEIRA: There were fishery surveys done in some of the lakes that

were selected, initially selected for the offsetting programs, and those fishery studies were done in order to determine what the -- or to provide input into the sustainable harvest plans being developed by the Partner First Nations.

MR. SHAW: Thank you.

THE CHAIRMAN: Ms. Bradley.

MS. BRADLEY: I have a number of questions regarding mercury. I would like to start, first of all, on page 14, and that's also slide 14. On this slide the map depicts a number of mercury sampling locations. Do these locations represent current monitoring locations or both the current and past?

MR. DAVIES: I believe it is up-to-date to 2012, and it contains all of the past and up to 2012.

MS. BRADLEY: Thank you.

MR. DAVIES: Sorry, from around, I believe, 1975 to 2012.

MS. BRADLEY: Okay. My next question will move on to slide 39 on page 71. This slide explains the predicted effects to fish in Gull Lake, but doesn't mention Stephens Lake. What are the predicted effects on Stephens Lake fish

population?

MS. SCHNEIDER-VIEIRA: Subject to check, but I believe that the concentrations in walleye and pike will increase to approximately .5 parts per million. Yes, that's true.

MS. BRADLEY: Thank you. And what uncertainty is associated with predicted fish mercury concentrations in terms of the magnitude and timing?

MS. SCHNEIDER-VIEIRA: In terms of the magnitude, they can be both higher or lower. We were trying to be fairly conservative in that we would tend to over-estimate effects, and that would be related to effects basically in the food web, what is happening in your food web, how many levels of concentration, if you will, are the organisms going through before the, let's say the pike or walleye eat them. If, for example, they eat a small fish, which then eats a larger fish and then it is consumed by the pike, that would cause an increase above our predicted levels, or it would tend to make it higher.

The other thing is in terms of the timing, if the peat breakdown is more rapid than you expect, then you would have more organic

material entering more quickly so your peak could happen more quickly and might be a little bit higher. If the rate of peat breakdown is slower and it is more protracted over time, you would expect a longer, flatter peak.

MS. BRADLEY: You may have covered this, so if you have, then I will move on. What increase in fish mercury levels in Stephens Lake or reservoir would be sufficient such that the proponent would extend fish monitoring farther downstream?

MS. SCHNEIDER-VIEIRA: It would be if it increases to greater than .5 parts per million. If it is less than that, we really don't think that we could have a -- that we would be able to detect any change further downstream.

MS. BRADLEY: So greater than .5?

MS. SCHNEIDER-VIEIRA: 0.5.

MS. BRADLEY: 0.5, thank you. Further then, given the uncertainties involved on the downstream limit of increased fish mercury levels, would it be more prudent to include fish mercury monitoring in the Limestone forebay from the outset and stop if no effects were observed, rather than initiate monitoring if concentrations

increase sufficiently in the Stephens Lake reservoir?

MS. SCHNEIDER-VIEIRA: We have the luxury in that the CAMP program, which has been previously described, is already monitoring mercury in the Limestone forebay. And so it is not as if we don't have any record of what is happening in mercury concentrations downstream. So basically that just leaves the Long Spruce reservoir where presently we would extend our monitoring to if we see changes greater than expected in Stephens Lake.

MS. BRADLEY: Okay. You touched on this; to what extent have the effects of wetlands been included with respect to predictions of fish mercury concentrations?

MS. SCHNEIDER-VIEIRA: The mercury models were based on the amount of flooded material. And so we didn't distinguish amongst peat or forested areas. And in terms of the two models that were used, the one that was developed from work that had been done in all of Northern Manitoba essentially integrates the full range of conditions of flooding that happened in those various reservoirs. For the other approach that

we took where we simply looked at how mercury concentrations had increased in Stephens Lake, that is based on a more similar topography, or more similar terrain, and so that's largely a peat based environment, and so those two approaches were used for determining the mercury levels.

MS. BRADLEY: And my final question; is sampling planned for total mercury or methylmercury in sediments in the reservoir or downstream during the operation phase?

MS. SCHNEIDER-VIEIRA: The current aquatic effects monitoring plan does not include any monitoring of sediment quality. We anticipate that, or we felt that based on the predicted effects that sediment quality monitoring was not required. However, if the Department of Fisheries and Oceans or Manitoba Conservation and Water Stewardship indicate that we should include sediment monitoring, it can be done. There has been baseline information collected as part of the EIS studies.

MS. BRADLEY: Thank you.

THE CHAIRMAN: Mr. Nepinak.

MR. NEPINAK: My question is going to be on slide 60, page 92. And I believe you have

answered a portion of the question that I'm going to ask, but I'm going to ask it anyway, because it asks for more information. Can you discuss the various types of evidence that can be used to determine or infer where lake sturgeon are spawning, and which of those types lead to the conclusion that spawning is occurring at each of the locations or general areas shown?

MS. SCHNEIDER-VIEIRA: All right. I will go through it area by area. First of all, starting with the turquoise area at First Rapids; at that location we observed aggregations of sturgeon in spawning condition, as well as we found a larval sturgeon going through what are called drift samples. That is you can put floating and sinking nets into the water that have a very fine mesh and they collect what is drifting in the water column, and so we did collect some larval sturgeon from that location. In addition the First Nations, particularly from Tataskweyak, had identified that as a spawning location. In terms of the Kelsey Generating Station and the Grass River, as I mentioned previously, those were both historic spawning locations. We have been sampling extensively in both of those areas

looking for sturgeon in spring. And we have found one large female in the Grass River, which we have recaptured many years, and one year she had a significant decline in her weight, and you would expect that she had spawned in that year.

Also as I mentioned previously we did catch in I think it was 2006, and this year, a female sturgeon downstream of Kelsey which did -- had some eggs that could be extruded. As I said, we didn't view that as sufficient evidence of definitive spawning in that area.

Moving on downstream to Long Rapids; two larval lake sturgeon were captured just downstream in 2004, once again in drift traps. Then going further downstream in the Birthday Rapids area, for quite a few years we have captured sturgeon in spawning condition down there. And finally going down to Gull Rapids, as I mentioned earlier we did catch sturgeon, I was told, in spawning condition downstream of the rapids in either 2000s. And both Birthday Rapids and Gull Rapids have been identified in the traditional knowledge reports as spawning areas. I can't recall if spawning has been reported by the First Nations in the Long Rapids area, though

I wouldn't be surprised if it had been.

MR. NEPINAK: Thank you. Is it possible that other spawning areas exist in the study area that have not been identified?

MS. SCHNEIDER-VIEIRA: We have had some reports from Clark Lake that there might actually be another set of spawning areas -- where the river enters Clark Lake there is some fast flowing water, and it is not clear to us, we have had First Nations who report, yes, we are catching sturgeon at these locations. We haven't done test netting through Clark Lake in spring that I'm aware of.

MR. NEPINAK: You mentioned there was a discussion on fish salvage by one of the questions earlier. What kind of -- what method is used for fish salvage?

MS. SCHNEIDER-VIEIRA: In the Wuskwatim area we used gill net sets. And I would have to check whether or not we used other methods as well.

MR. NEPINAK: Okay. Thank you.

THE CHAIRMAN: Mr. Yee.

MS. SCHNEIDER-VIEIRA: Sorry, it was just noted for smaller fish in the Wuskwatim area

we also used what is called backpack electro shocking. You can put a very small current through the water. It temporarily stuns the fish, they float to the surface, and you can basically scoop them up. It doesn't cause any long term harm to them, and it is actually a very effective way of capturing fish with minimal handling.

MR. YEE: Just a few questions that I have. Yesterday we heard from Ms. Matkowski that the numbers of lake sturgeon are increasing in the study area; is this correct?

MS. MATKOWSKI: The numbers of lake sturgeon that we are seeing coming to those spawning areas that Friederike described have been going up slightly. And as I mentioned, they are small, young fish. So what we believe is we are starting to get more fish maturing into adult age.

MR. YEE: Thank you. I guess, based on this information and referring to the exhibit registered by Mr. Williams yesterday entitled Recovery Potential Assessment of Lake Sturgeon, Nelson River Populations, does this suggest that the population trajectory for lake sturgeon, Kelsey Generating Station to Kettle management unit number 3, might be more accurately described

as increasing?

MS. MATKOWSKI: I think that would be preliminary to say that. Having been involved in the development of that document and the workshops, there was a lot of discussion of whether or not we would call a trend increasing or stable, and I think that would still be uncertain enough that they wouldn't change it to increasing.

MR. YEE: I'm going to reword this. I had this question a few ways. I am going to reword it a bit. I'm trying to get a bit of a picture in terms of the Partnership has presented a lot of information, historical studies and there has been a lot of maps showing spawning areas, populations, genetics, existing habitat, and you have projected the post project habitat. So I'm just wondering, and I guess I could put it in relation to slide 79 on page 111. This slide states on a regional scale there is more habitat than sturgeon. And again I guess we heard that this morning about continuous habitat or discontinuous habitat for the sturgeon. I'm just trying to put this into perspective. If the Keeyask project didn't proceed, I'm wondering what would the status or the population of sturgeon be

in this particular reach of the river?

MS. SCHNEIDER-VIEIRA: That has been obviously the topic of considerable discussion. I believe that in IR CEC31 we provided some additional information on the status of the various sturgeon populations in the area. And I'm going to start off with the Burntwood and Kelsey area. We know, it is information that we also provided, that there are some young sturgeon, which Ms. Matkowski noted, are growing up to become spawners. They are young fish, I would say in their early 20s, but I'm guessing there. They are -- the large females that are really, the most highly productive group in the population are extremely rare in this area. I personally can think of one very large female in the Grass River and that's all. The other sturgeon that we have been seeing are very small, are the smaller ones, with a much lower reproductive potential. It is possible if we leave this area alone and come back 100 years from now, we will see that the population has gradually increased. But that rate of increase will be very small because currently we have a very low number of reproducing individuals, and they are small and their ability

to produce is quite -- they are just not producing a large number of eggs. And it would be considered very vulnerable.

When we move further downstream into the Gull Lake area, we have a somewhat different situation. We have some large sturgeon still left there, very few but there are some, but we have this extremely limited recruitment, so we are seeing young fish being born, and I'm just going to use the figure 1 in 10 years, that's what we have seen to date. So if anything were to happen to those very few females that are reproducing there, that population will be lost.

And then finally we move down to the Stephens Lake area, where I'm going to just estimate now, it is about 65 or 70 per cent of the sturgeon that we caught there are from this 2008 year class. So it is an extreme remnant, and it is very vulnerable to extirpation. If we left it all alone, whether it would increase at a very, very slow rate over time, it could. It could also disappear entirely. So the answer to your question depends on what part of the river we are looking at.

MR. YEE: Just a few more questions,

Mr. Chair. I'm just trying to clarify the proposed remedial measures for sturgeon. It sounds like these questions have already been raised, but I'm just trying to get some context around this. Based on the testimony yesterday in the EIS documentation, suitable habitat for all stages of lake sturgeon are required in order for self-sustaining population to be established and maintained; is that correct?

MS. SCHNEIDER-VIEIRA: Yes, that's correct.

MR. YEE: So in the EIS documentation and testimony, as well yesterday, stated that the known existing sturgeon nursery habitat upstream of Gull Rapids in the vicinity of Caribou Island will be altered by the Keeyask project in a matter that is likely to render it unsuitable as lake sturgeon habitat; is that also correct?

MS. SCHNEIDER-VIEIRA: Yes, that's correct.

MR. YEE: We also heard yesterday that the creation of a nursery habitat for lake sturgeon has not been undertaken elsewhere. And in supporting documentation for the EIS, it is stated that the likelihood of success in

constructing a new nursery habitat for lake sturgeon is considered to be low to moderate; is that correct?

MS. SCHNEIDER-VIEIRA: Yes, that's correct. And I would add that we have the backup provision, first of all, of the stocking, as a way of providing additional time so that, you know, if your first attempt does not succeed, you can continue to work in the environment to try other things, perhaps greater areas. I mean, there is a variety, a whole range of potential approaches that could be used. The other point that I made this morning is that we were taking a very conservative approach. And it is possible that our young-of-the-year sturgeon would use a greater range of habitats than we indicated in the EIS. And that's based also on more recent information since preparing the EIS.

MR. YEE: Thank you. I guess based on your responses as well as my previous questions, the probability of successfully creating or constructing a nursery habitat to replace the existing conditions would you say is low to moderate, or does that mean the likelihood of success or establishing -- sustaining the

population of lake sturgeon in this reach is low to moderate?

MS. SCHNEIDER-VIEIRA: I would say that it would be low to moderate in the first instance, but that over time -- we do have time, and that your probability of success would increase as time goes on. And as I said, at the time that we prepared this document we didn't have information which we now do looking at, for example, Stephens Lake where we have some not young-of-the-year sturgeon, but sturgeon that are a couple of years old, which are using a much greater range of habitat than we had expected. And we know that those young sturgeon don't move very much, and so that is opening up to us the possibility that even our young-of-the-year sturgeon are able to move -- to use more -- a greater range of habitat than when we had prepared the EIS, and that is consistent with what has also been recently found in the Winnipeg River.

MR. YEE: Thank you very much.

MS. MATKOWSKI: I would like to add if I could, that as Friederike mentioned before, we have been very conservative in dealing with this issue of habitat for young-of-the-year and stating

that sand is their preference, but they are likely to use a broader range. And I would like to just give you one more statement from my favorite document, the Manitoba Lake Sturgeon Management Strategy, 2012, and it says, that protecting habitat is also important. Lake sturgeon in several parts of the province have demonstrated they can adapt to fairly severe habitat alterations while proving unable to adapt to excessive levels of harvest.

So they are a very robust fish is the point I'm trying to make, and they have been seen to adapt in many other places, including the Winnipeg River here in Manitoba.

MR. YEE: Thank you very much. I have no further questions, Mr. Chair.

THE CHAIRMAN: Thank you. I have a few random questions. Slide 114 shows a map in respect of cumulative effects assessment, and it indicates an inservice date for Conawapa as 2025, 2026. What is the earliest start date for Conawapa?

MS. SCHNEIDER-VIEIRA: When doing the cumulative effects assessment we relied on input from basically the Manitoba Hydro engineering

team, so I would need to consult with the appropriate people.

THE CHAIRMAN: Does Mr. St. Laurent know that?

MS. SCHNEIDER-VIEIRA: Mr. St. Laurent is checking.

THE CHAIRMAN: Okay. Thank you. We will move on. On slide 57, you show a comparative abundance of the various lakes in Northern Manitoba. Is the catch per unit effort for all species or just for sport fish?

MS. SCHNEIDER-VIEIRA: Let me just check. I believe that it was for all the large bodied species. Yes, it is for all species that were caught in what we call our standard gang nets. So that is a range of mesh sizes.

THE CHAIRMAN: Thank you. Slide 63, the map depicts spawning shoals in the reservoir. Dr. Schneider, you've indicated in testimony in the last day or two, that spawning shoals could be built in the reservoir. Is this could or will?

MS. SCHNEIDER-VIEIRA: It should be will.

THE CHAIRMAN: Thank you. A question of clarification, Dr. Schneider; we heard earlier

in response to Dr. McLachlan, you indicated that the Kettle Generating Station flooded 228 hectares on Stephens Lake. I'm sure you meant 220 square kilometres?

MS. SCHNEIDER-VIEIRA: Yes, that was a number that Mr. Davies indicated to me, and I see that I was the victim of his poor handwriting. I'm sorry.

THE CHAIRMAN: Thank you. And one final observation from me, this CAMP program looks like a very good start for a regional cumulative effects assessment. We will just leave that unanswered as an observation. And perhaps after lunch if Mr. St. Laurent can get back to us with the early start date for Conawapa.

MS. PACHAL: I can answer that question. In the EIS we considered Conawapa 2025, 26 as the earliest inservice date.

THE CHAIRMAN: Earliest inservice date. But when would be the start date for construction? You talk about overlaps or potential overlaps with Keeyask construction and Conawapa construction. Keeyask is 21, 22 for final inservice; is that correct?

MS. PACHAL: Keeyask would be 2019 for

the first unit inservice, and last unit inservice 2020.

THE CHAIRMAN: So when would Conawapa commence so that there might be some overlap? Would it be starting in 2017, 2018?

MS. PACHAL: About the end of 2016, beginning of 2017.

THE CHAIRMAN: For construction or the review process?

MS. PACHAL: Start of construction.

THE CHAIRMAN: Okay. Thank you very much. Again our timing is not bad at all, it is time to break for lunch, we will come back at 1:30.

(Proceedings recessed at 12:32 p.m. and reconvened at 1:30 p.m.)

THE CHAIRMAN: Okay, I'd like to reconvene. I believe there is one new panelist that needs to be sworn in, so Madam Secretary?

MS. JOHNSON: Could you please state your name for the record.

Brian Knudson: Sworn.

DR. EHNES: Good afternoon Mr. Chair, members of the Commission and the audience.

Mr. Davies described the overall

approach to the aquatic and terrestrial assessments, and Dr. Schneider-Vieira described the aquatic assessment approach.

I will now present the overall terrestrial assessment approach. The presentation will start by explaining how an ecosystem testimony based approach was implemented. Among other things, this provides a foundation for describing how VECs, supporting topics, and study areas were selected. This will be followed by the overall approach to assessing project and cumulative effects, which sets the stage for presenting results for terrestrial ecosystems, habitat and plants. Ms. Wyenberg and Mr. Berger will then tell you about wildlife.

Dr. Schneider-Vieira did a good job telling you about the aquatic ecosystem and its linkages. I get to talk to you about the terrestrial ecosystem.

If you fly over Keeyask area, you will see jack pine growing on gravel ridges, large black spruce bogs, marshes and streams, and many other different ecosystem types. The kind of plants you find in a particular place are mostly determined by climate, wild fires, and glacial

processes. Glacial processes refers to how the glaciers scraped and shaped the land, and then how glacial Lake Agassiz deposited material on the land after the glaciers left. Among other things, glacial processes created the topography and determined where the lakes and the rivers would be. The kinds of mineral deposits and topography left by the glaciers largely determine what kind of soils will develop over time and where different kind of plants will grow.

For example, very large peat lands have formed over thousands of years in the low lying areas that were left by glacial processes. These are examples of drivers for change and linkages between ecosystem components.

Another example of ecosystem linkages is the plants in this diagram.

And I'm just going to see if I can get a mouse going, okay.

The plants in this diagram are converting sunlight into living material. The plants are eaten by animals, and these animals are eaten by other animals. When the plants die, they become part of the soil and cause it to change over time.

A strong foundation was built for the terrestrial assessment by taking a regional ecosystem based approach. The Keeyask regional ecosystem is a key focus of the terrestrial environment assessment. The terrestrial assessment starts with the big picture, regional ecosystem, wildlife populations, and then evaluates how this big picture will be affected by the project. The focus is on maintaining regional ecosystem health and self-sustaining wildlife populations.

To implement the regional ecosystem based approach, an early step in the terrestrial environment assessment was to identify the regional ecosystem that includes the Keeyask project. Natural ecosystem processes were used to determine the boundaries of the regional ecosystem.

In this slide, you see a satellite image that was captured around 2000. Most of the pink areas -- there are some bright pink areas here and here -- in this satellite image are recent burns. And if you look at the number of large pink areas, and lighter pink areas, bright green areas, you'll see that large burns are a

common feature in the Keeyask area.

In fact, fire is the dominant natural force or driver that changes ecosystems in the Keeyask region. The species that live in the Keeyask region are used to coping with frequent large fires. Animal populations survive in the region, either because they can find alternative habitat elsewhere when a fire occurs, or they make use of recently burned areas. In other words, by the time a new area burns, other burned areas have become old enough to replace them.

An historical fire analysis determined how large of an area is needed to maintain a relatively stable habitat composition so animals have new areas to move to as fires occur. In other words, the fire regime determines the appropriate size for the regional ecosystem surrounding the Keeyask project.

This map shows areas burned by fires. Different colours are different decades going back to 1953. The very light green areas are areas that were burned prior to 1953. One thing to note about this map is that there are not many large very light green areas left in the left two-thirds of the map. So if you look in this part of the

map, you don't see very many areas that are this light green colour.

Another thing to note is that large fires are much less common in the area to the east of the study zones used for the assessment, so if you look in this general area over here.

Basing the regional ecosystem size on fire ecology has two important implications for the terrestrial assessment. First, the project region is large enough to support self-sustaining populations for most of the resident wildlife species as large fires occur over the time.

Second, even though large areas burned in the project area over this past summer, the terrestrial assessment conclusions are still valid because they have already taken into account the fact that large fires frequently occur, and fires will continue to occur in the region after the EIS submission.

Regional ecosystem boundaries were mapped by extending outwards from the project footprint and disturbance areas. So, actually this map doesn't have it, but the project footprint areas are here, and there's project traffic, increases to traffic as a result of the

project that extend along PR 280 all the way back to Gillam here.

So the boundaries were mapped by expanding outwards from the project footprint and disturbance areas, through similar ecological conditions, until the appropriate size as determined by the fire regime was achieved.

Relevant ecological conditions were fire regime, surface materials, land forms, watersheds and climate.

The strong change in a number of ecological factors near Long Spruce, so that's in this general location here, formed the eastern boundary during this expansion. And as I previously noted, fire is a driving force for natural ecosystems, and this area to the east of our study zone boundaries, fires are much less common.

And the fact that fires are less common reflect strong differences in surface materials, soils topography and climate. This slide shows the dominant surface materials and how they change at the western edge of what is called the Tyrell Sea deposition zone. So after the glaciers left, this area to the east was inundated

by a sea. And this general area here was the western limit of that sea and its deposition zone.

In this area to the east, the terrain is flat compared to being somewhat rolling in this area to the west. Additionally, there are major differences in the dominant vegetation and soils in study zone five compared to the areas to the east of it. This reflects differences in climate as well as surface materials and soils.

So if we look at the photo to the right, this is a representative photo for areas when you get away from the Nelson River. It's dominated by these raised bogs you're seeing in white and dark green, which are interspersed amongst these very wet peat lands.

When you move into the area where our regional ecosystem is located, the terrain becomes rolling and it's a mixture of forest woodlands and some wet peat land areas, but there's a much greater variety of ecosystems.

The strong change in the number of ecological factors east of the Long Spruce Generating Station formed the eastern boundary for the Keeyask regional ecosystem. So this is the area along here. Study zone five is the regional

ecosystem for the Keeyask project.

The Keeyask regional ecosystem was a focus of the terrestrial environment assessment, including evaluating changes to ecosystem condition and health, and to ecosystem components of high social concern.

The project would have a number of impacts on the terrestrial environment, such as vegetation clearing, soil excavation, flooding, traffic and noise. And this diagram here shows some of those impacts. And we tend to think of a hydroelectric generation project primarily as a river impact project. But in terms of the terrestrial environment, there are a number of other effects that need to be considered.

And on this basis, the VECs and supporting topics were selected by carefully considering terrestrial ecosystem linkages and the potential pathways of project effects on ecosystem components.

On that basis, 13 VECs and nine supporting topics were carefully selected to provide a reliable indication of project and cumulative effects. Each of the specialists will speak to VEC and supporting topic selection for

their discipline.

In brief, for terrestrial ecosystems, habitat and plants, there are four VECs and four supporting topics. There is one terrestrial invertebrate supporting topic, one amphibian and reptile supporting topic, for birds there are six VECs and one supporting topic. And finally for mammals, there are three VECs and one supporting topic. Mercury and wildlife is also included as a supporting topic.

A local and a regional study area was identified for each VEC and supporting topic using ecological criteria. A VEC is affected -- or a VEC or supporting topic is affected inside the project footprint. In this diagram here, for example, flooding, clearing, access removes habitat or animals. In this hypothetical example, habitat for moose is lost in the project footprint.

Indirect effects occur near the project's footprint. For example, noise or vegetation alteration remove habitat for moose.

The local study area is where project effects on moose are most visible. That is the local study area is the project's zone of

influence on moose. And this holds true for all of the VECs and supporting topics.

Although effects on individual moose are certainly of interest, the question of ultimate concern for the cumulative effects assessment is how project effects on individual moose and other ecosystem components translate into long-term effects on wildlife populations and regional ecosystem health.

A VEC's regional study area is used to put local project effects into a broader context and to assess cumulative effects.

A VEC's regional study area assesses cumulative effects because it's focused on ensuring that regional ecosystem health is maintained and that regional wildlife populations are self-sustaining.

Regional study areas are a practical way to identify the wildlife populations and regional ecosystem affected by the project. They are a practical way to calculate the amount of available habitat with and without the project. They are a practical way to search for overlap of effects from other past, present and reasonably foreseeable future projects.

The cumulative effects assessment considers effects from projects physically located outside of the regional study area. An example is construction traffic for the Keewatinoow Converter Station that is travelling from Winnipeg to Conawapa. The cumulative effects assessments considers the dust created and the potential wildlife mortality created by this traffic, where that traffic passes through the VEC's regional study area. And those are not the only effects that are considered from these other projects that are physically located outside of the regional study area.

Local and regional study areas for the VECs and supporting topics were generally selected from six study zones that were mapped using ecological criteria. This map shows those six study zones.

Study zone five, which is the green shaded area plus all of the areas nested within it, is the Keeyask regional ecosystem. It captures the zone of influence around the project footprint and the increased traffic on PR 280. The Keeyask regional ecosystem is a regional study area for the ecosystem VECs such as intactness and

ecosystem diversity. The Keeyask regional ecosystem was also the regional study area for wildlife species for which study zone five was the appropriate size for maintaining a self-sustaining population.

This regional ecosystem based approach provides a strong foundation for the terrestrial assessment, for example, as the basis for evaluating project effects on regional ecosystem health: For the remaining species, the regional study area was the one that was the appropriate size to support a self-sustaining population.

Caribou had the largest regional study area, shown as study zone six in this map, because caribou range over a wide area. Beaver had a smaller regional study area, which was study zone four.

Some VECs or VEC components had additional study areas because the population affected by Keeyask moves over very large areas. For example, Pen Island's caribou had an additional study area that captured their movements into Ontario.

In the interrogatory, or the information request responses, including a recent

additional filing, the Partnership addressed questions as to why the Keeyask study zone five was not extended to the east to include Conawapa and other existing and identified future projects in the areas to the east. In those responses, and in slides nine to 12 of this presentation, we have explained the ecosystem based rationale for selecting the study zone five boundaries.

Two additional considerations were as follows: First, the Keeyask project is not expected to have any detectable terrestrial effects in areas outside of study zone five, including the regional ecosystem to the east that includes Conawapa. Second, the ways that the regional study areas are used for the cumulative effects assessments provide full consideration of any effects that arise from any project or activity located outside of a VEC's regional study area.

When speaking to slide 20, I gave an example of how traffic from projects located outside of the regional study areas was considered in the assessments. In other words, the assessment approach considers the terrestrial effects of all projects on the Keeyask regional

ecosystem and the Keeyask VEC populations no matter where the other projects are physically located.

Now, a few words on how the assessments were conducted prior to summarizing project and cumulative effects on VECs.

The assessment of potential project effects and recommendations for reducing adverse effects started very early on in the assessment process and has continued on an ongoing basis.

Major reductions in potential project effects on terrestrial ecosystems and wildlife species were achieved through a highly interactive, collaborative, project design process involving Manitoba Hydro engineers and environmental specialists, the KCNs, and technical experts.

Examples of outcomes are a low head option that considerably reduced terrestrial flooding. North and south access road routes that minimized effects on species and sensitive sites. Borrow area and excavated material placement area locations that minimize effects on species and sensitive sites. In fact, the project design process eliminated the need for additional

mitigation for many terrestrial issues of concern.

I will now turn to terrestrial ecosystems, habitat and plants. The presentation begins with an overview of the Keeyask regional ecosystem, which is followed by an overview of project studies conducted to support the assessments. Finally, I will talk about project and cumulative effects on terrestrial ecosystems, habitats and plants, as demonstrated through the VECs and supporting topics.

The Keeyask regional ecosystem is characterized by, firstly, a relatively harsh climate. The land surface and soils are dominated by peat lands. Terrestrial habitat is predominantly a mixture of black spruce on various types of peat lands.

Project studies were conducted over 10 years. Data was collected at a large number of locations. Vegetation, soils, and other environmental attributes were mapped from large scale current and historical air photos.

Information was collected on plants, trees, soils, peat depth, and other environmental attributes. Plant and soil samples were collected for lab analysis. Details regarding the range of

studies that were conducted to support the assessments can be found in the terrestrial environment supporting volume.

Based on careful consideration, four VECs and four supporting topics were selected to contribute to providing an overall picture of how the project would contribute to cumulative effects on the regional terrestrial ecosystem and ecosystem components such as wildlife species. In the following slides, I will provide an overview of the cumulative effects assessments for terrestrial habitat and the first three of the four VECs. I would be happy to answer questions on all topics following the presentations.

In general, I won't be mentioning mitigation. As previously mentioned, the project design process and measures included in the environmental protection plans eliminated the need for additional mitigation for many terrestrial issues of concern.

What do we mean by terrestrial habitat? It refers to combinations of vegetation and eco-site types. Eco-site types are ecologically meaningful combinations of soil, groundwater, slope and other environmental

factors. Terrestrial habitat is responsible for many important ecological functions such as converting sunlight into life, producing oxygen, storing carbon, and providing food and shelter for wildlife. These are some of the reasons why terrestrial habitat effects are fundamental to the overall effects assessments.

This slide now is going to tell us about project effects on terrestrial habitat. The maximum expected potential amount of direct and indirect terrestrial habitat loss and alteration from project infrastructure, flooding, and other components is 9,400 hectares. This is the maximum expected amount of potential effects for several reasons.

First, some of the potential borrow areas, excavated material placement areas, and disturbance areas will not be used. Second, clearing in the proposed project footprint will be minimized. Third, the assessment assumes that the first 50 metres surrounding the entire potential project footprint is lost, even though evidence indicates alteration will average about 25 metres. And fourth, the predictions have not subtracted the native habitat recovery in temporarily

disturbed and cleared areas.

The potential significance of these terrestrial habitat effects was evaluated using benchmarks. Ms. Cole used this slide in her environmental assessment approach presentation to provide the general overview of thresholds and benchmarks. I'm going to show how this general approach was applied for the terrestrial VECs using terrestrial habitat as an example.

We are using the term threshold to refer to the point or range where the sustainability of the VEC is threatened. Regulatory or established thresholds were not available for the terrestrial VECs and supporting topics. Consequently, benchmarks that represent a level below that where significant effects on a VEC may occur were used.

Turning to total terrestrial habitat to illustrate this approach, studies indicate that ecosystem function and biodiversity effects may occur under some conditions once total terrestrial habitat loss reaches 20 percent of predevelopment area. More serious ecosystem effects occur as terrestrial habitat loss is increased. We don't need to know where the exact point or range for a

threshold is if the assessment takes a precautionary approach by setting a benchmark well below where this point or range is expected to occur.

On this basis, the benchmark for when effects are more seriously considered is set at 10 percent of habitat lost or altered in the case of total terrestrial habitat. More serious consideration means the potential for significant effects, when considered in combination with other factors, additional mitigation is considered and more in depth monitoring included. Note that we are including habitat alteration in addition to loss when measuring total terrestrial habitat effects.

Numerous sources were used for these magnitude benchmarks for the VECs and supporting topic indicator measures. The primary sources for the benchmarks can be found in the EIS.

So now I am going to show you how these benchmarks are used to put Keeyask project effects on total terrestrial habitat into the context of cumulative effects. I'm going to spend some time explaining this chart because you will be seeing a few of them in this presentation.

First off, you will notice that the colours in the chart have been reversed from the previous figure. The previous figure showed habitat loss, while this one shows habitat remaining. In other words, a 10 percent habitat loss benchmark is the same thing as a 90 percent habitat remaining benchmark.

When looking at these figures, the key thing to remember is that green, the green background shows where there is no risk to the VEC. Yellow is increasing concern. And orange means the VEC is no longer sustainable. You'll also notice that the background colours transition to reflect the potential effects on the VEC also are a gradual transition until a threshold is approached.

This figure considers four time periods and these will be presented for each VEC. Predevelopment, which is this first blue bar, is the first period. Predevelopment refers to the period prior to industrialized development, which is basically 1950, except for the railway line.

In study zone five, which is the regional terrestrial ecosystem, 100 percent of native terrestrial habitat was remaining in the

predevelopment period. So that's this first blue bar you are seeing here.

The next three periods represent existing cumulative effects, Keeyask combined with existing cumulative effects, and Keeyask combined with existing cumulative effects and the effects of reasonably foreseeable future projects.

Past and current projects have removed or altered approximately 5 percent of total terrestrial habitat in study zone five, leaving 95 percent of predevelopment habitat.

Keeyask could remove or alter an additional 0.7 percent of total terrestrial habitat, reducing total remaining habitat to approximately 94 percent of predevelopment area. Reasonably foreseeable future projects could remove or alter an additional 0.4 percent of total terrestrial habitat, which would still leave approximately 94 percent of predevelopment area.

Using the benchmarks, the conclusion is that cumulative effects on total terrestrial habitat with future projects remains within a regionally acceptable range.

Intactness is the first terrestrial VEC that I will talk about. What is intactness?

It is essentially asking how much has the regional ecosystem been altered by human impacts. Intactness was selected as a VEC because it's an umbrella indicator for many ecosystem effects. The intactness VEC is used as the habitat intactness indicator for most wildlife species. Caribou is a more sensitive species, so in the mammal presentation you will hear about how habitat intactness was measured for caribou.

The indicator measures used for intactness are, the total length of roads, rail lines, and other human linear features per square kilometre. This is called total linear feature density.

Because some features such as roads have much higher ecological effects compared with other linear features, several groupings of linear feature types are measured.

Core area is the second intactness indicator measure. Core areas are the areas that are left after removing places that are inside or close to human features.

This map shows existing linear and other human features in study zone five. The green shows all of the core areas that are larger

than a thousand hectares after removing human features, including cut lines and a buffer around them. Cut lines are narrow trails usually cleared to provide access to areas for various types of exploration activities.

So going back to a cumulative effects chart, the green is at the bottom again in this chart, because having less or fewer linear features is better than having more. This chart shows the progression of cumulative linear density from the predevelopment period forward to the existing environment.

In the predevelopment period, which is shown here, linear feature density was zero for all indicator measures. Past and current projects have produced a total linear feature density of 0.45 kilometres per square kilometre in study zone five. This is a worst case scenario because it includes all cut lines, 35 percent of which are regenerating naturally. Total linear feature density without cut lines is 0.15 kilometres per square kilometre. And transportation density, so that would be road and rail lines, is only 0.07 kilometres per square kilometre. And all of these densities are well below the benchmark for modern

magnitude effects, and two of them are well below the low magnitude benchmark.

The Keeyask project would reduce total linear feature density. Now, this may sound counterintuitive. It happens because flooding and borrow areas remove some of the existing linear features. And this is one of the reasons that core area was also used as an intactness indicator measure, so that the effects of flooding and borrow areas on intactness are captured.

Future projects would increase total linear feature density from 0.44 kilometres per square kilometre to 0.48 kilometres per square kilometre. And boy, this must be exciting stuff. But this is a very important ecosystem indicator, so I must go through this.

THE CHAIRMAN: We trust you.

DR. EHNES: Thank you.

Future transmission projects are responsible for this increase.

Turning now to the core area indicator measure. Core area is larger than a thousand hectares, accounted for 99 percent of the land area in the predevelopment period. Core area has been reduced to approximately 83 percent of land

area by past and current projects. Keeyask would further reduce core area to approximately 82 percent of land area, while reasonably foreseeable future projects would further reduce core area to approximately 81 percent of land area.

And again, this is the worst case scenario estimate of core area loss, because it includes all cut lines, 35 percent of which had good regrowth when surveyed in 2011.

Regionally, total human disturbance is relatively low based on linear feature density and core area remaining. The conclusion is for intactness, cumulative effects are within a regionally acceptable range.

THE CHAIRMAN: Help me a little bit with some of my confusion. You said early on that 20 percent was sort of a crossing line. And once it got above 20 percent damage, then it's a problem. So is that why when we get to slide 47, 81 percent is okay?

DR. EHNES: The 20 percent was not the crossing or the tipping point. That was the level of habitat lost where effects on the ecosystem are becoming visible. That tipping point would be a

much higher level of habitat loss. So that benchmark of 10 percent is set well below the 20 percent, where we think the effects are starting to occur. That benchmark was for a total terrestrial habitat. The benchmarks for core area are set based on what is important for core area for animals. So because core areas are the interior areas, or the areas that are away from human disturbance, the benchmarks are different for core area.

THE CHAIRMAN: So the 90 percent benchmark just applied to the terrestrial habitat as a whole?

DR. EHNES: Yes.

THE CHAIRMAN: And now the benchmark for this particular VEC, intactness, is 40 percent? Is that -- on slide 47?

DR. EHNES: Yes, I'm just going to that slide.

THE CHAIRMAN: There.

DR. EHNES: Yes.

THE CHAIRMAN: So the benchmark is 40 now for this particular?

DR. EHNES: Yeah. The level of core area loss, which is a much smaller component of

total habitat, the low magnitude benchmark would be 35 percent and the moderate magnitude benchmark would be 60 percent.

THE CHAIRMAN: Okay.

DR. EHNES: Now, this is at core area, not total terrestrial habitat, so they are very different. If I go back to the previous slide or set of charts for linear feature density, they are expressed in terms of kilometres per square kilometre. So each VEC or supporting topic, the benchmark is selected as a value that's relevant for that indicator measure.

THE CHAIRMAN: Okay. It will clear up as we move along, but that was helpful. Thank you.

DR. EHNES: Yeah.

The next VEC is ecosystem diversity. Ecosystem diversity is the variety of ecosystems in the region. Ecosystem diversity was selected as a VEC because it is an umbrella indicator for many ecosystem effects, and because maintaining biodiversity and ecosystem diversity is a fundamental goal for land use planning and many government policies. The overall goal is to maintain a natural mixture of ecosystem types. In

practical terms, ecosystem types are mapped and measured as the various habitat types.

The key indicator measures used for ecosystem diversity are percentages of land area occupied by each of the native habitat types and the amounts of the priority habitat types. A priority habitat type is a habitat type of particular interest for ecological and/or social reasons. Examples are rare habitat types, or habitat types that may include many plant species.

This pie chart shows the habitat composition of the Keeyask regional ecosystem. And you'll see on the right-hand side here the three black spruce peat land types dominate the existing habitat composition of the Keeyask regional ecosystem, accounting for two-thirds of total terrestrial habitat.

Forty-three priority habitat types, shown in this area, account for approximately 29 percent of total terrestrial habitat. The remaining non native habitat types account for about 2 percent of terrestrial habitat.

The project will not eliminate any native habitat types, so none of them will be completely removed. Neither will it substantially

change the proportions of any native habitat types. So if we go back to this pie chart, the project would not change the size of the slices, or the pie slices in this chart.

The vegetation rehabilitation plan, and this is one point where I'll talk about mitigation measures, will give preference to rehabilitating the most affected priority habitat types, which will reduce reported effects for some types. So in other words, when I talk about project effects, they don't take into consideration the vegetation rehabilitation measures.

Cumulative effects on priority habitat types with existing projects, the Keeyask project, and reasonably foreseeable future projects, will vary by priority habitat type.

Cumulative effects range from 5 percent to 8.8 percent of the estimated predevelopment area for 39 of the priority habitat types.

Cumulative effects would increase to 9.9 percent of the estimated predevelopment area for one balsam poplar type, and the project will not affect three of the priority habitat types.

Now, these effects are overestimated for many types for the reasons I described for total terrestrial habitat, because we have taken a precautionary approach to including the entire possible footprint and the zone of indirect effects. As well, the vegetation rehabilitation plan will give preference to rehabilitating the most affected priority habitat types.

So the conclusion for ecosystem diversity is that cumulative effects are within a regionally acceptable range.

I'll now turn to the wetland function VEC. Wetland functions are the natural properties or processes that are associated with wetlands, but stating them in ways that describe what they do for the ecosystem.

Some wetland types such as marshes make high contributions to overall ecosystem function. Marshes are high quality habitat for muskrat, moose, waterfowl, and some song birds, and marshes are pretty much the only place where some plant species are found.

In this map, the orange shows upland areas while the green shows wetlands. Most of the region is covered by wetlands. Since most of the

region is covered by wetlands, the total terrestrial habitat and ecosystem diversity results that I have already presented evaluate effects for most wetland types. The wetland function assessment in the terrestrial environment supporting volume goes into a detailed analysis of the various types. This chart shows the cumulative effects going all the way through to future projects on total wetland area. And what you see in this chart is true for most of the wetland types in the region.

An exception is Nelson River marsh. All of the native marsh has been removed by past and current projects. It is noted that the total amount of marsh in these reaches of the Nelson River was quite low prior to hydroelectric development.

So since most of the region is covered by wetlands and the terrestrial habitat, and ecosystem diversity analysis accounted for effects on most wetland types, the indicator measures used for wetland function were effects on the particularly important wetland types in the Keeyask region. The particularly important wetland types were wetland sites identified as

being globally, nationally, or provincially significant by Ramsar, the North American Waterfowl Management plan, Ducks Unlimited, or the Manitoba Heritage Marsh Program.

The other particularly important wetland type was marsh in off-system lakes and waterways.

Wetland sites identified as being globally, nationally, or provincially significant do not occur in the region.

The project will affect approximately 12 hectares of marsh in off-system lakes and waterways. Mitigation includes developing 12 hectares of off-system marsh. So with the mitigation, the conclusion for wetland function is that effects are within a regionally acceptable range.

Effects on terrestrial habitat, ecosystems, plants, will be monitored through an integrated terrestrial effects monitoring plan. The terrestrial effects monitoring plan will monitor implementation of EIS commitments, including mitigation, the effectiveness of mitigation. The terrestrial effects monitoring plan also includes a process to respond to effects

being more adverse than anticipated. And the benchmarks used for the adaptive management triggers will generally be the same as the ones that are used for the regulatory significance assessment.

Some of the terrestrial ecosystems habitat and plant components that will be monitored by the terrestrial effects monitoring plan will include terrestrial habitat loss and indirect alteration, success of the vegetation rehabilitation plan, marsh mitigation, including how the marshes are used by wildlife, effects on the VECs, fire regime effects, since this is a key driver for terrestrial ecosystems. And I'll note that there are no expected project effects on the fire regime, rather this is a risk to be managed, for example, accidental fire starts. And finally, invasive plants.

Before handing the microphone over to Ms. Wyenberg, I'd like to summarize how the information provided in this presentation provides context for the wildlife assessments.

The terrestrial habitat and ecosystem VECs use predevelopment areas as the reference point for cumulative losses. It was possible to

estimate these values for the terrestrial habitat and ecosystem VECs. This is not so easily done for wildlife habitat. Detailed historical mapping is needed to quantify available habitat for some wildlife VECs. This is because some elements of wildlife habitat are based on spatial attributes, such as how much forest edge is available, or the amount of certain kinds of vegetation close to a shoreline.

And these amounts cannot be estimated by simply extrapolating habitat proportions.

The limited cumulative effects on terrestrial habitat and intactness provide the context for wildlife change evaluations. This is the primary basis for using changes from current available, as the reference point for project and other future changes to available wildlife habitat.

Thank you for your time.

THE CHAIRMAN: Thank you, Dr. Ehnes.

Ms. Wyenberg?

MS. WYENBERG: Good afternoon, panel members. My name is Leane Wyenberg, and I'm pleased to present to you two presentations this afternoon. The first one will be an overview of

the terrestrial invertebrate, amphibian and bird assessment, and the second one will be our assessment that looked at mercury and wildlife.

So I'll begin by giving a brief overview of our terrestrial invertebrate and amphibian assessments, but I'll spend most of my time this afternoon talking about the bird assessment, going through essentially the topics or the issues that came up during the information request process. I'll explain some of the methods that we used to gather our information. I'll talk about how we identified the study areas for our assessment on birds, how we selected our bird valued environmental components, as well as the priority birds, what those are. And then I'll get into a discussion about the benchmarks that we used for our bird assessment, and then move on to the results and discussions for some of our bird VECs, and finish up with some monitoring plans.

We studied terrestrial invertebrates, which includes your insects, your spiders, your snails. We studied these because they are at the base of the food chain, so they are important in the environment, they are important for other animals, they are an important food source for

many birds, but they are also important for plants as well.

We study amphibians because they are, too, food for other organisms. They are at the base of the food chain, and they are sensitive to changes in wetland habitat.

Northern leopard frog, when most of our studies focused on the two species that occur within the region, the wood frog and boreal chorus frog; however, we did consider the fact that northern leopard frog has occurred within the region historically. They are listed, their western population is listed as special concern. Historical records come from western science and ATK that they were once abundant throughout this region, but suffered from severe die-offs in the 1970s, not just in this area, but in their western population range.

Here is a map showing you the study areas that we used for the terrestrial invertebrates and amphibian assessment. Study zone four in the blue was identified as the regional study area for terrestrial invertebrates. It provides a good representation of the various habitats that would be used by insects. It was

also used as the regional study area for amphibians, because it was considered to be large enough to capture the breeding population of amphibians along the Nelson River.

And study zone three, in the white, was identified as the local study area for both the terrestrial invertebrates and amphibians.

There are no provincially rare or listed species of terrestrial invertebrate known to occur within the region, or expected to occur in the region. And that's due to the fact that habitat for the listed species is not suitable within the region.

Our assessment of terrestrial invertebrates was based on the scientific literature for boreal invertebrates that would be comparable to this area of Keeyask.

All of the terrestrial and aquatic areas, the land and the water, is considered habitat for terrestrial invertebrates, because many of these species have a life stage that is dependent upon water. Mosquitoes would be an example of that.

Overall, the project is not expected to affect insects within the region, up to

4 percent of their habitats may be altered or lost due to the project.

Moving on to the amphibian assessment. Sampling for amphibians began in 2001 and carried out through to 2011, and continues to today's date. Sampling occurred throughout the region with focus on the wetlands or the ponds that would be used by amphibians for breeding. Boreal chorus frog and wood frog are the two species, as I mentioned, that occur within this region. They are known to breed throughout, favouring the inland ponds and wetlands that provide suitable breeding habitat, breeding habitat that is free from fish predators. That's a key factor for amphibians.

Up to 3 percent of available habitat for amphibians would be lost through the project. This 3 percent is considered a worst case scenario. We know that new amphibian habitat will form in areas along new infrastructure. For example, along the south access road, in the ditches where water is going to pool or has a tendency to pool. Also along the dyking systems, often water will pool in those areas and provide habitat for amphibians.

In some of the decommissioned borrow areas, there could be deep pits that retain water. Those areas have also been shown to, over time, support amphibian populations.

In conclusion, the project is not expected to affected regional amphibian populations.

We study birds for a number of reasons. They are important for a number of reasons, including ecological importance. Like I mentioned for invertebrates and frogs, they are part of the food chain. They are important, they have their various roles, including seed dispersal for plants. They are also considered very important to people. A number of species like ducks and geese are harvested by local resource users, including the First Nation communities. And some bird species are very spiritually valued, for example, the bald eagle.

And then there's the regulatory importance. Migratory birds are protected under the Migratory Bird Convention Act. All birds are protected under Manitoba's Wildlife Act, and species at risk are afforded protection under the Manitoba Species at Risk Act, and/or the Federal

Species at Risk Act, SARA.

A considerable amount of data has been gathered on the bird community at Keeyask. We began collecting information in 2001, and carried out a number of surveys throughout this last 10 to 12 years. Our surveys have followed standardized widely accepted protocols. We have targeted migratory birds, but also included sampling for the resident species like the owls and the grouse. We have used a variety of methods, you can't just use one method to sample the over 178 birds that occur within Keeyask.

For the wide ranging waterfowl, raptors, we used aerial surveys to get a good understanding for the distribution and abundance of these birds throughout the region. We used boat based surveys to get a more in-depth understanding of what was happening on Gull Lake in parts of the Nelson River. We also did a number of point counts in the forest to get information on the forest birds, the breeding birds and the inland areas.

We targeted the migratory birds like the song birds, which also include Olive-sided Flycatcher, which is a listed species. And we

even did some nocturnal surveys trying to target the Common Nighthawk which is more active in the evening, and Yellow Rail as well.

And during this process, we have worked alongside the First Nation communities and gathered a lot of local knowledge through that process.

Part of our approach also included a review of historical information, including information from ATK, in order to understand the effects of past projects.

We have also assessed this project, Keeyask, in combination of future projects for our valued environmental components.

So here is our study areas that we used for the bird assessment. Study zone five is the large green area. It was used as the regional study area for Bald Eagle and Canada Goose. This area was considered large enough to capture a breeding population of Bald Eagles along the Nelson River. They are a wide ranging species and widely distributed throughout.

We felt it was a suitable study area for Canada Goose because Canada Geese are actually transient through this area. They are migrating

through Keeyask on their way to their northern breeding grounds. So we felt that zone five was large enough to capture a representation of that transient population of geese moving through.

And I want to mention that we recognized geese would be moving through between their breeding and wintering grounds, and they also may be moving along the Nelson River towards the downstream areas. The Hudson Bay coast is an attractive spot for Canada Geese. It's an important staging area for them along that area. So we recognized that Canada Geese would be moving through downstream areas and potentially interacting with future projects in that region. So even though our study area is zone five, we did consider that birds are mobile and they are moving outside of these boundaries that we have identified.

Zone four was identified as the regional study area for Mallard and all other birds. We felt that it would have been appropriate to use zone five, that it would have captured a representation of the breeding populations of these birds. However, we wanted to be a bit more conservative and felt that we would

go with a zone four as our regional study area, which is used as our assessment area for this project. And zone three is the local study area that was used for all birds.

Now we get into the process of how we selected our valued environmental components for birds. Like I mentioned, there is about 178 species that we have identified occurring within the Keeyask region. And during the process of identifying which would be VECs, we considered all of them. And we looked at whether or not these birds were potentially affected by this proposed project. And that really helped us to narrow down this large list to about 27 species. And these 27 species we called the priority birds, because they were ecologically, socially, or regulatory important.

We took this list of 27 and narrowed it down even further. It went through a rigorous process with many meetings and discussions. We had the First Nations' involvement and feedback and discussions with them. And what we initially came out of that process with was three migratory birds as our VECs, the Mallard, the Canada Goose and the Bald Eagle.

Mallard and Canada Geese are very important socially because they are valued by the First Nation communities. They are used as subsistence food. They are traditionally harvested annually, and are considered very important. The Bald Eagle is spiritually significant and was treated as a VEC for that reason.

In response to regulatory concern, we looked at all of our eight species at risk that could occur within this region. And taking the same approach, we identified, or at least considered which of these eight species would be affected by this project. And that process revealed that there is three species of birds that breed within the area, have breeding habitat that would potentially be affected by the project. Those three species became VECs, Common Nighthawk, Olive-sided Flycatcher, and Rusty Blackbird.

The remaining five species at risk were not VECs for the following reasons. There was low potential for project effects, that was the case for Yellow Rail. We did survey for Yellow Rail but they were not detected within the region. Habitat that occurs within the Keeyask

region is considered marginal for the species. Their preferred further habitat actually occurs in areas further east along the Hudson Bay, James Bay coastal lowland areas, and in areas further south.

The Short-eared Owl is also a species where we did not see the potential for project effects. There's no breeding habitat for this species within our local study area.

Peregrine Falcon and Red Knot are transient. They are migrating through the region during the spring and fall migration periods. Their preferred habitat is in areas further north.

The Horned Grebe is a water bird that uses habitat that's similar to the Mallard, so we felt that it was represented by the Mallard VEC. However, although they were not treated as VECs, they were treated as priority birds and they were assessed in full.

Gulls and terns are colonial water birds. They were treated as a priority bird. Gulls and terns are dependant upon rare environmental features for breeding, like the rocky reefs in the islands in the Nelson River, like in Gull Rapids and in areas upstream. We recognize that they are valued by the First Nation

communities. We know that Gull eggs were harvested in the past. However, during the process of identifying our VECs, it was indicated that they were valued but they weren't as highly valued as say other species that had become VECs, the Mallard, the Canada Goose and the Bald Eagle. However, that said, they were the focus of a considerable amount of study. And we have put in a lot of efforts and thoughts and considerations into potential mitigation measures to offset the effects of this project on these species.

Moving on to the benchmarks, there are no defined regulatory thresholds or benchmarks for birds. So this prompted us to do a review of the other EIAs to see what they were using for their benchmarks when they were assessing project effects on birds.

What that process revealed was that it was a common approach to use a 25 percent benchmark for determining whether or not project effects were of high magnitude. This 25 percent benchmark measured habitat loss against existing conditions, and it was also used for all birds, including species at risk.

We considered that, and we approached

it with a bit more conservatism. We set a 20 percent habitat loss benchmark -- 20 percent benchmark for habitat loss relative to existing conditions. We used this for Mallard, Canada Goose, Bald Eagle and most other birds. However, we felt that we should be even more conservative for species at risk because they are less common on the landscape, and are more sensitive to disturbance. So we set a 10 percent habitat loss benchmark, measuring habitat loss relative to existing conditions.

Now, I just want to point out that the purpose of setting benchmarks is to alert the assessor, to alert ourselves of the pressure that's being exerted on the back of the species that we are examining, so that if necessary, we take a critical review to see if there's any other project effects or influences that might contributing to the pressure being exerted on our VEC. It's more of an alert system, it's not necessarily that once you hit your 10 percent benchmark you have got a significant effect, it's really just an alert system, it's a way to inform ourselves to say that, hey, let's take a closer look at things.

So now I'll just give you sort of an overview of our key results and conclusions for our bird VECs. So, beginning with Canada Goose, breeding habitat will not be affected by this project because areas that are preferred by geese occur further north and further east of the project area. However, the regional study area is used as a stop-over site during the spring and fall migration periods. It's during these times that geese are very, become a very important food source for the First Nations because they are out on the land hunting them during these spring and fall migration periods, in particular spring, as the birds returning from their wintering ground are apparently the best tasting. So that's an important time of year for harvest.

Following impoundment, goose use of the reservoir is anticipated to be minimal. However, we anticipate that use of the reservoir by geese will increase as aquatic plants begin to re-establish.

In conclusion, the project in combination with future projects is not expected to affect the sustainability of Canada Goose populations throughout the region and in areas

further north.

For the Mallard assessment, there's two things I want to just point out or draw attention to. The first one is that Mallard in this region breed in the in-land lakes, creeks, and wetlands. These are the areas that we see Mallards rearing their broods, taking care of their young. Habitats along the Nelson River shoreline area are considered more marginal for this species, not only just because there's fluctuating water levels and marsh habitat is really unpredictable in terms of the years that's actually available, depending on high water levels, but also because the Nelson River is a river and has supported, as you know earlier, a lot of fish. And Mallards tend to breed in areas where there's not that many fish, because fish are a key predator of ducklings.

The second thing I wanted to point out was that during the information request period, we had the opportunity to revise our Mallard assessment. We had new information, more detailed mapping of the Mallard aquatic habitats, so we used that to update our assessment. And in order to take a worst case scenario approach, we

included those marginal Nelson River shoreline wetland areas in our assessment, and considered that as part of the overall habitat lost.

So this updated information revealed that in the EIS, we reported a 3 percent loss of Mallard habitat relative to what's available within the region. The revised IR indicated four and a half percent, approximately 5 percent of habitat affected. This change doesn't change our conclusions that we described in the EIS, and that is that the project, in combination with future projects, is not expected to affect the sustainability of Mallard populations within the region.

Bald Eagles are probably one of the most common raptors that we've seen during our studies. They are highly visible and they occur along the Nelson River where there's the attraction to the forage, the fish forage. Bald Eagles do nest along the river. There is approximately six nests between Birthday Rapids and Gull Rapids. The highest concentrations of eagles that we see along the Nelson River happens during the July, August time frame, when you get a lot of the non-breeders coming into the Nelson

River to take advantage of the abundance of food.

The project is expected to increase the availability of nesting and perching habitat, because as we know, with the creation of the reservoir, the shoreline area is going to increase. We also know that with the creation of the reservoir, there will be land clearing within the reservoir footprint, and that some of these nests will be lost as a result of clearing. However, as you can see in the picture, there's mitigation planned for that. Any of the nests that will be lost will be placed with artificial nesting platforms like the one you have seen here. These have been proven to be successful. Manitoba Hydro has had experience with these in the past. They have put up a number of them for Osprey and have had that work out really well.

We also expect that with the project, the distribution of eagles will change in response to the creation of the reservoir and the tailrace area below the generating station. We would expect more eagles to be concentrated in those areas below the generating station.

In conclusion, the project is not expected to affect the sustainability of regional

Bald Eagle populations.

Common Nighthawk is a species at risk. It's listed as threatened under the Species at Risk Act. It's a migratory bird that prefers dry mineral ground with bare -- basically dry mineral sites that have little vegetation. It likes to nest, as you can see in the picture, just kind of right in the rocks, not a lot of cover. Maybe you can't see it, but it is using itself as its own cover, it's got the camouflage. And that's kind of its tactic to elude predators. But its preference is for the dry upland sites that have minimal ground cover. Quite often these areas are rock outcrops, gravelly sites, areas that had been recently burned. Suitable habitat for Common Nighthawk is not considered limiting within the region, or within the borrow region of Manitoba. In fact, it's very widespread and very abundant, and it's regenerated by fire.

So this is a map showing you the distribution, and it gives you a sense of the abundance of this habitat. What we're showing you here in this map is where nesting habitat would occur. Foraging habitat for the species is widespread, and if we mapped foraging habitat, I

think we'd map the whole area as suitable foraging habitat.

We are showing primary and secondary nesting habitat, which is essentially primary, being the most preferred, and secondary being the second most preferred breeding areas. And this is study zone four. I just want to mention that we have mapped the habitat within zone four, but that it doesn't end at that zone. It does continue and extend into the surrounding regions, that there's suitable habitat throughout.

During the construction period, there will be a short-term gain in Common Nighthawk habitat, and that is largely associated with the land clearing that will happen within the reservoir footprint.

Some habitat for Common Nighthawk, however, will be lost due to the construction of other project footprints like the roads or the borrow areas.

Over the long-term, during operation, we expect that there will be an overall loss of Common Nighthawk habitat, up to about 10 percent. This is considered to be the worst case scenario. As habitat loss is based on zone four, which as

you might recall, I said was the more conservative zone, that we could have used zone five but felt that we'd be more sensitive to effects by using the smaller regional study area, we're comparing it to a 10 percent benchmark that we set in order to be more sensitive to project effects. And the fact is, new habitat will be created for this species. New habitat will form in the decommissioned borrow areas that become inactive. And by considering the potential for that, we could see the loss of up to 10 percent decrease to the loss of just over 5 percent. It's hard to estimate that at this point because we don't know how many borrow areas actually will be developed, but just that there's good potential for this number to be offset when borrow areas become decommissioned.

The individual Common Nighthawks that will be displaced from the actively developed project footprint areas will use the alternate areas that are available throughout the region. Habitat for this species is not a limiting factor. It's not limiting the species within the region and it's not limiting their more global populations. And that we expect individuals will

relocate.

Overall, the project in combination with future projects is not expected to affect the Common Nighthawk populations.

Olive-sided Flycatcher is a species listed as threatened. It's also a migratory species. It prefers to nest in the mature spruce forest that occur along forest edge. So you get forest openings that are created by fire or wetlands, beaver flood. Quite often these areas support dead standing trees which are a very important factor for Olive-sided Flycatcher, as they require perches in open areas to sit on when they are foraging for their flying insect food.

Suitable habitat for this species is not limiting within the regional study area, or for that matter in the greater area of the boreal Manitoba.

Their habitat is regenerated by fire, like the Common Nighthawk, and it is, and the species is not using all of their available habitat. That's sort of the general for all of these species at risk, their populations are low, there's more habitat available for them than they can actually use. And based on some of our data

that we have collected and based on professional judgment, the Olive-sided Flycatcher within this region are not using all of their available habitat.

So here is a map showing you the widespread distribution of their preferred breeding habitat, the primary being the most preferred, and the secondary habitat being the second most preferred. And again, this map is really focused on where suitable nesting habitat would occur. If I included foraging habitat, that would definitely take up a lot more of this map.

In the EIS, our assessment was based on the loss of primary habitat. We concluded that a loss of up to 5 percent habitat could occur as a result of the project. We have updated that to reflect secondary habitat. Secondary habitat was mapped and modelled in our recent modeling report. And by including secondary habitat, which is again not their preferred habitat but second most preferred habitat, we come up to about 9 percent habitat loss overall. This is considered the worst case scenario.

Again, like the Common Nighthawk, we are basing this loss on the smaller zone four.

We're comparing it to our 10 percent benchmark. And it also doesn't include new habitat that may be formed or created or enhanced through mitigation. Some of our mitigation being considered, the measures being considered include putting up perching poles in some of the open areas along forest edge, as perching poles, as I mentioned, are a key part of the structure that's required by Olive-sided Flycatcher.

Because our updated assessment had us approaching our benchmark, we felt that we should take a sensitivity analysis and have another critical review to see if there's any other project related factors that might be affecting Olive-sided Flycatcher. So we did. We looked at whether or not our project would be increasing the risk of mortality. The answer to that is no. We're clearing outside of the breeding period. We are filling the reservoir outside of the breeding period. These are factors which are going to avoid any increase or any, you know, effects of mortality on this species. So in the end, no influential factors were identified that would increase the sensitivity to the species.

So understanding that habitat isn't

limiting for the species, it's abundant, it's not all being used throughout the region, considering that and the amount of habitat that would be affected in combination with future projects, we do not expect that this project and future projects would affect regional Olive-sided Flycatcher populations.

Rusty Blackbird is another migratory bird. It's listed as special concern under the Species at Risk Act. It breeds in the shrubs and conifers that occur along the wetland edges, feeds on aquatic insects, usually aquatic insects from the shallow pools that occur along creeks and in some of the wetted areas.

Suitable habitat for this species is not limiting within this region. It is widespread throughout the region in boreal Manitoba. And Rusty Blackbird, like the Olive-sided Flycatcher, are not using all of the available habitat that is out there for them.

This is a map showing you the distribution of their habitat, primary being the most important habitats and secondary being the second most. Up to approximately 6 percent of their breeding habitat will be affected by the

project. Some of this habitat will be, a loss will be minimized through the retention of riparian buffers along some of the inland lakes and creeks. Overall, the project in combination with future projects is not expected to affect the regional Rusty Blackbird populations.

So we know that gulls and terns breed on the rocky reefs at Gull Rapids. They also breed in some of the areas upstream. There is a number of rocky islands and reefs that are also being used. Some of these areas will be lost as a result of the project. We did consider and look to see whether or not there would be alternate suitable habitat for these birds following project development. And we determined that their habitat is not common in the area. The main goal is to maintain these colonial waterbird populations throughout construction and throughout operation. And because there's some uncertainty as to whether suitable habitat will form following project development, or how these birds will take to even just alternate more marginal areas, because there's that uncertainty, we have committed to providing alternate nesting habitat for these birds.

So here's a picture of some of those alternate nesting habitats. We're considering the use of reef rafts for Common Terns. You can see there's a reef raft with a load of common terns on it. This one is taken from the Toronto harbour where the Canadian Wildlife Service and the City of Toronto have been involved for a number of years putting out and replacing habitat for Common tern, has proven to be very successful, to the point where they are now considering putting in a permanent island.

There is also in the top left-hand, here, this big nesting platform. This is a large nesting platform that has been put out for terns, and it has proven to be successful.

There is also consideration of perhaps enhancing existing islands with riprap or just making conditions more suitable for gulls and terns by island enhancements, something similar to the effect of this picture to get that idea across.

We're also considering the creation of artificial islands for gulls, and there's also the potential of using barges during the operation phase, as barges have also proven to be very

successful for supporting colonial waterbirds. We're confident that any of these measures, or a combination of these measures will provide effective habitat for gulls and terns that are displaced from their traditional nesting grounds. All of these measures have shown to be very successful in areas throughout Canada and the United States.

For the most part, these enhancements and this level of effort is put out for Common Terns or other tern species, it's actually rarely ever put out for gulls, because gulls are very adaptable and are good at using even marginal habitats they can be successful on. However, the partnership is still committed to providing for these birds as well, to ensure that their populations continue to be viable within the region.

So the partnership is currently working with Environment Canada to finalize the details about these measures, about what will be used, where we'll be implementing it. All of those details will be provided in a terrestrial mitigation implementation plan. We will not only be including all of those details about our

colonial waterbird mitigation, but also for Bald Eagle nesting structures, what those will look like and where those will go. I didn't mention it, but Mallard nesting tunnels are another measure that is being considered to improve or enhance Mallard nesting habitat. Olive-sided Flycatcher perching poles will be included in that plan, as well as wetland enhancement creation planning.

So that gets us into monitoring for amphibians and bird. We have committed to monitor for both of these groups, during both the construction and the operation phases. The purpose of our monitoring plan is to assess the effectiveness of our mitigation measures and our key EIS predictions. We want to understand whether or not alterations or improvements or modifications are needed to any of the mitigation measures that we implement.

Amphibians will be monitored looking at their breeding activity and existing wetlands, and wetlands that are formed near infrastructure. We will also be looking at wetland use by amphibians in some of the wetland enhancement areas. We'll be monitoring changes in bird

abundance and distribution, looking at Bald Eagles, Mallard, Canada Goose, species at risk, colonial waterbirds, and other birds like grouse and songbirds.

We will be examining the use of alternate nesting habitat that we provide out there for colonial waterbirds, the effectiveness of the Bald Eagle and Mallard nesting structures. We'll be also wanting to understand how the decommissioned borrow areas are being used by Common Nighthawk, and the effectiveness of our perching poles if those are placed out on the landscape for that species. And the effectiveness of our wetland marsh enhancement areas, how are they being used by birds and how effective is that?

So that brings me to my mercury and wildlife presentation which, I don't know, it's 3:05 I think.

THE CHAIRMAN: It is. I think we should take a break now and come back at 3:20.

(Proceedings recessed at 3:05 p.m. and reconvened at 3:18 p.m.)

THE CHAIRMAN: I would like to reconvene.

Okay, Ms. Wyenberg, carry on.

MS. WYENBERG: Thank you.

Okay, so now we will get into an overview of our mercury and wildlife assessment. We already heard earlier how mercury is expected to increase in the aquatic environment during operation. Dr. Schneider-Vieira discussed how this is going to, or could affect fish. And now I will take the next 15 minutes or so to build on that by explaining the implications of increased methylmercury on wildlife.

Before I begin, I just want to point out that this assessment wasn't all done by myself. I can't take credit for it. Mercury in mammals was conducted by Mr. Rob Berger and his team at Wildlife Resource Consulting. And the bird assessment was conducted by myself and my team at Stantec.

Secondly, I'm only going to be presenting how increased mercury can affect wildlife, I won't be assessing how this could affect human health through consumption of wildlife. That's covered by the socio-economic panel.

So I will begin by giving a brief

overview about methylmercury and why it is a concern for wildlife, with focus on birds and mammals. As well as I will give a summary of our approach and how we determined existing levels in animals, and how we predicted future levels in animals. I will also describe how I used risk assessment to understand the exposure risk for some species of wildlife. We used the hazard quotient analysis, and I will explain that. I will get into the results and conclusions and finish up with some monitoring.

In the earlier presentation we heard about how methylmercury can bio accumulate in the aquatic food chain. Now I am just going to summarize it again here, because it is a complex topic and some of you might have missed it.

Mercury is a naturally occurring element in soils. When you flood soils, you release this inorganic mercury into the aquatic environment. Once it is in the aquatic environment, it is inadvertently eaten by bacteria as they are digesting organic material, through their digestion they switch this inorganic mercury into the methylmercury form, which is the form that we are concerned about, because it can affect

the health and well-being of animals. Animals at the bottom of the food chain eat the bacteria, absorb methylmercury, and pass it on to those animals that eat them.

As methylmercury is passed up the food chain, it can bio accumulate and bio magnify. At high concentrations it has the risk to affect the health and reproduction of animals. Very rarely is it ever lethal. More commonly the adverse effects are related to a decreased ability to reproduce. With the exception of birds, which can remove large burdens of mercury from their bodies through feather loss, for most animals it is a very slow process in removing mercury from their body. Fish eating wildlife that are at the top of the food chain, like river otter, mink, bald eagle and osprey, are the most at risk to increases in methylmercury. The animals that are consuming diets mainly of plants are considered to be the least at risk, and that's because plants take up very minute quantities of methylmercury. So the animals that would be experiencing minimal risk from increases would include beaver, moose, caribou, and Canada Goose.

We did an extensive review of

literature in order to assess and understand the potential risks or affects of mercury exposure in birds and mammals.

Background or existing levels of methylmercury in wildlife was estimated using a number of approaches. For some species the levels were based on information that we got from the scientific literature. Canada Goose would be an example.

For birds, the existing levels were estimated using the levels that were reported in the fish flesh that was sampled from fish taken at Gull Lake and Stephens Lake. Fish data was therefore used as an indicator or proxy for the levels in birds.

Baseline data was collected from mammals to estimate background or existing levels. Predicted levels of methylmercury in wildlife was estimated using the modelled predictions in fish, we heard about that from Dr. Schneider-Vieira's presentation earlier. Those modelled estimates will be used as a proxy or indication of the levels that would be in birds. We used historic and recent data from nearby reservoirs to predict the levels that we expect to see, or could see in

some of the mammal species. We also ran a screening level analysis to determine the risk of top predator fish eating species to elevated levels of methylmercury. So for Bald Eagle, osprey, river otter and mink, we used a hazard quotient analysis, which I will describe in a bit more detail momentarily.

So our review of the literature identified some research that indicated similarities between mercury levels in fish and mercury levels in birds that were eating similar diets. They are eating the same foods, they are foraging in the same areas, the mercury levels were very comparable.

So it was suggested that the local fish would be a much better indicator of the levels in birds than trying to use levels of mercury reported in birds from other areas. And this is largely due to the fact that methylmercury levels can be highly variable from one area to the next, due to just even differences in geology alone.

Existing levels in birds were therefore based on mercury levels measured in the fish sampled at Gull Lake and Stephens Lake. Lake

whitefish, for example, eat a variable diet, and let me be specific, mature lake whitefish eat a variable diet, including small fish, aquatic insects, insect larvae and snails. Levels in lake whitefish were used to estimate the levels in some of the waterfowl species that eat similar foods, common golden eye, for example, and white-wing scoter, those are two waterfowl species that eat almost the same foods.

For species like mallard, we would expect the levels to be less than that reported in lake whitefish because mallard are eating a diet consisting more of the plant and insect based foods that are at the lower end of the food chain.

For fish-eating birds, we used pike and walleye to get an understanding of what the potential levels would be in the bird tissue because they are eating similar diets. And of course, for birds that are eating pike and walleye, like Bald Eagle and osprey, we would expect that levels would be slightly elevated or higher than those reported for pike and walleye, because of the bio accumulative factor from one trophic level to the next.

Post impoundment levels in birds were

predicted using the modelled estimates for methylmercury in reservoir fish and Stephens Lake fish.

For mammals, existing levels of mercury, methylmercury was based on information from the scientific literature, but also from the baseline data that was recently gathered by the Keeyask Cree Nation Partners. The KCNs were involved in the development of a study design that involved the collection of tissue samples from beaver, muskrat, mink, otter, moose and caribou. Moose and caribou were included in this because of concerns for human health regarding the consumption of these foods. Samples were gathered along the Nelson River, but also in comparative areas that occurred extensively throughout the inland region.

Post impoundment levels for beaver, muskrat, mink and otter were estimated using historical information from other reservoirs, such as Southern Indian Lake, and from more recent data that was gathered from nearby reservoirs like the Stephens Lake area.

So one way to characterize the risk of increased mercury exposure to wildlife is to

conduct a hazard quotient analysis, which involves looking at the ratio between the average concentration of mercury ingested to a known concentration where adverse effects could occur. This risk characterization was developed by the U.S. Environmental Protection Agency, and it has been used by other impact assessors to evaluate or assess the potential effects of mercury on wildlife. The analysis gives a general sense if the population is vulnerable to a toxic element.

The result of the analysis is compared to a benchmark of one. So if your result by looking at your ratio of what is being ingested to what could cause an effect, if you look at results of that and compare it to one, if it is less than one, then there is low or no potential for adverse effects on the exposed population. If your value is greater than one, it is an alert, it's an indication that there is a potential for adverse effects on the exposed population and that more study is warranted.

We ran the analysis for bald eagle, osprey, river otter and mink, our four indicator species that are considered to be most at risk to potential adverse effects due to mercury bio

accumulation through the consumption of fish. We ran this analysis for osprey, even though osprey are not considered common within the Keeyask regional study area.

The analysis was based on a worst case scenario. There were some big assumptions in that, for one, we are assuming that all of the species are eating all of their fish from the Keeyask reservoir or Stephens Lake, and we know these species are wide ranging, they are using a variety of habitats, they are not going to be exclusively only foraging from the reservoir. However, we assumed that they were, and we assumed that the fish they are eating contained the highest modelled methylmercury levels. Dr. Schneider-Vieria showed that there is a number of model outputs. We used the highest outputs from those models to run this assessment.

So the results and conclusions for birds indicate that there will be minimal exposure for birds during the operation phase, and that's largely due to the fact that use of the reservoir by birds will be minimal, and as well for Stephens Lake. So the exposure, the amount and number of birds feeding off methylmercury, foods containing

methylmercury would be low.

Levels in Canada Geese are not expected to change, and that's because Canada Geese are plant eaters and plants take up very small quantities of mercury. Levels that are predicted in mallard are well below the levels shown to affect reproduction. And for bald eagle and osprey, our hazard quotient analysis came out under one, which indicates minimal risk for adverse effects on these populations. We know that methylmercury levels will increase, but it is not expected to affect the population.

And for gulls and terns, gulls eat a varied diet, they are very opportunistic, eating a variable food source, including some small fish. The effects are expected to be negligible because of this. And as well as for terns, mainly because they are eating the small fish.

In conclusion, there is no measurable adverse effect expected on the health of the regional bird populations.

For mammals, background methylmercury levels for the plant eating species are not expected to change, so things will stay the same for beaver and moose and caribou. Background

levels will increase for river otter and mink. However, the hazard quotient analysis indicated that there is a low potential for adverse effects. The result of our analysis was less than the benchmark of one. However, there is potential for localized adverse effects on some individual otter that forage exclusively within the reservoir of Stephens Lake.

That said, the overall conclusion is that there is no measurable effects on the health of the regional mammal populations.

Part of our mercury and wildlife monitoring plans include the monitoring of bird populations, or the abundance and distribution of birds and mammal, including bald eagle, osprey, waterfowl, other water birds, otter, mink, muskrat and beaver.

Methylmercury levels in fish will be monitored and those will provide a good indication of the levels in birds. Monitoring of mercury levels in wild game samples will occur on a voluntary basis, and they will be provided by the local resource users.

Thank you.

THE CHAIRMAN: Thank you,

Ms. Wyenberg. Mr.Berger?

MR. BERGER: If we can take a moment while I can shuffle around?

THE CHAIRMAN: Certainly.

While this shuffling is going on, I would just like to point out, or note to the participants as they are preparing for cross-examination, there are three distinct presentations here with different page numbering. So when you come up to ask your questions tomorrow, please be clear as to which, either which panel or which presentation you are referring to so that it is relatively easier for them to find the proper slides to show.

MR. BERGER: I just need another moment to set up the presentation.

Good afternoon Mr. Chairman and Commissioners, participants, and members of the public. My name is Robert Berger, as Dr. Ehnes had introduced me, and I'm here to present an overview on the materials concerning the effects to mammals with respect to the Keeyask Generation project.

Just sorting out the bugs.

I will begin the presentation this

afternoon with reiterating some of the things that Dr. Ehnes said about an ecosystem approach which also included the mammals. And I will then briefly review the valued environmental components, and the selections, study areas and field studies, and I won't spend too much time on that. But then I will move on to discussing the effects predominantly on caribou and moose, and a brief overview of the monitoring program. With time constraints, the presentation I think will mainly focus on caribou and moose, but I would be happy to answer any questions that the Commission and the participants have on any of the species in the area.

Now, as Dr. Ehnes described earlier, the approach to mammals was an ecosystem based approach. So when we start, we ask ourselves two key questions. You may have heard these key questions before, Dr. Schneider-Vieira also used them in her fish presentation, is how do we approach an assessment and how do we determine what to study?

You have all seen this diagram before and I'm sure you are very familiar with it. So the ecosystem based approach follows those

pathways that include connections to the environment. The measures of these connections consider things from habitat such as food cover, space, which the Keeyask area provides for up to about 40 or so mammal species in the study area.

Now, the linkages amongst the environmental components are often complex, and changes in some of these elements can actually affect more than just a single species. So here, for example, I will find my pointer, let's follow this particular pathway with moose browse, and let's say this is a pile of willow, and here is the moose and this is the food web and, of course, the moose is browsing on the willow. And its energy is taken up, it grows. And of course, if you follow this pathway, there is it's primary predator, which is a wolf. We also consider secondary linkages and pathways, because once moose and wolves are in the system, then of course you get some pressure on caribou, which is the well known connection that we know.

However, we can't study everything when we do an environmental assessment. And often we tend to measure changes by looking at what we classified as the most influential drivers that

affect a population.

And of course, when we start these types of considerations, we have to think about how the environment will be changed by the project. And we get this information from the project description and from the physical environment. And of course, here we can see our Keeyask dam. And we see the new road that goes through the area to Gillam. And of course, you know, there is things like construction and operations. So how do these pathways affect the most influential drivers?

Now, the most influential drivers that we used, and that were the pathways essentially that influenced populations the most, were studied and measured as part of the environmental assessment. And those included key things here that you see, like habitat, predators, harvest, human features and disturbance, which is the well-established linkage to fragmentation effects that we know so well, and we hear a lot about.

As Dr. Ehnes described earlier, here is fire, which is that example of the natural disturbance regime that's driving the boreal forest. It is the predominant driver, and fire is

often, and was considered in the mammals effects assessment.

So for moose, for example, they prefer those younger habitats. And of course with caribou, they usually require those older habitats.

Now, at one point I would like to make out that here on the map that is being demonstrated, which was the same map that Dr. Ehnes used, here we see the burn categories from 1953 up to today. And at this scale, it appears coarse and there is a lot of the area that is certainly burned in the Keeyask region. But if you look at it at a finer scale, maybe such as the stand or the site level, the burns, the burns at that scale can be less, and here is why. And there are such things in the boreal forest called skips, which are areas that don't burn at all. So there are, there is habitat left in the landscape, but at a finer scale. And here you can see the green areas left over, and often they are wet areas such as this one. Some of these wet areas that I can describe later are well connected to caribou. So sometimes they are left untouched. There is a lot of factors, of course, that affect

this skip distribution, such as the fire intensity, soil, moisture, precipitation, et cetera.

Moving on to the valued environmental components. So the valued environmental components selected for the project are caribou, moose and beaver. And generally the main supporting topics was the effects of mercury, but as part of this process we also described priority mammal groups, including small animals, fur bearers, large carnivores. But moving back and taking a step back to caribou, it was selected because there is certainly a potential for substantial project effects. They are important to people, it was emphasized whoever I spoke to. The availability of suitable information influenced the selection of the VEC. And of course, there is regulatory concerns with caribou. But in principle, they can also be used to represent other species that require mature coniferous forest environments, or older aged environments. And certainly we do know that they are sensitive to fragmentation.

Now, moose were selected for the similar reasons, they are important to people,

information availability, and so on. It is more of a generalist than caribou, it uses a lot of different habitat types. And it is very well associated with forest, and burns in particular. Of course, they love wetlands and riparian habitat as well.

For beaver, it is similar for selection reasons but, you know, beaver is also a keystone species, it creates habitat and environment for other species. And hence there is a connection and a value to beaver for flooding where other species can use it. But it also needs water and it prefers the deciduous forest and willow.

Now, you've also seen this map before. The mammal study areas usually corresponded to the ecosystem based approach. Now each zone that was selected for a particular species was selected because it was large enough to sustain a population in the order of hundreds of animals, which was discussed in the EIS. And it provided context also for a minimum viable population size.

Now, just as a quick reference, and I would like you to remember for later on in this presentation, the local study area for moose and

caribou was this yellow region here, which is zone four. And zone five in green, which extends all the way to Thompson, that was the regional study area for moose. It was also selected as the regional study area for a potential or hypothetical boreal woodland caribou population. And zone six in the purple was used for all caribou.

Now, there were additional study areas that were selected for the Environmental Impact Statement. Mammals for wide ranging species are not necessarily limited to ecosystem boundaries, they do cross boundaries. But, for example, for the adverse effects agreement, which has the offsetting programs, which are distributed throughout the Split Lake resource management area, and you can see the pink outline on the map which is the Split Lake RMA, just to get yourselves oriented. And here is the study zone five, which is the regional boundary for the moose population. But some of the studies, of course, were conducted beyond the regional study area to provide context or to provide context for future management considerations.

Now, the existing information that we

used, as noted in the EIS and the supporting documentation and in some of the information requests that came through, was captured by publications, there was limited aerial surveys that were historic or considered to be historic, but we really relied on the Aboriginal traditional knowledge that were offered by our project partners.

Other information included local knowledge, and some of that information came from the mammals working group. Other data included consideration of a caribou radio collaring from Manitoba Conservation and Water Stewardship. Now, I didn't use a lot of that in the EIS, but I certainly had considered that information. I had draft access to that information, so certainly did consider and write about it in the EIS, and used it to improve the request for information responses, to give you proper context about what we know about this general area.

I won't go through this in detail, but we looked at a number of species using a variety of scientific techniques. Moose and caribou studies ranged from ungulate surveys to specialized habitat surveys, and we used genetic

studies as well.

Now, we've arrived at the main part of the presentation. And as a reminder, we are going to look at the two focal species of interest, including caribou and moose. And first we will talk about caribou.

Now, before discussing the environmental effects, this particular subject matter can be complex, since caribou behaviour and range are often used to define populations. So I'm going to give you a little bit of background and refresher on the types of animals found in the region before proceeding.

Now, the Keeyask region is a mixing area for several populations. We do have boreal woodland caribou, which is defined by the Provincial and Federal Governments as a threatened species at risk. We also have the forest tundra eco-types defined by the Federal Government in that manner, which the Province calls coastal caribou. And if we call them coastal caribou, there are two groups that are generally named after where they calve, and that's the Pen Islands coastal and the Cape Churchill animals. Finally we have barren ground caribou, Beverly

Qamanirjuaq, which I will reduce to Qamanirjuaq.

We have created a table to help describe some of the similarities and differences amongst the caribou types in the region. So on this top you will see, here is boreal woodland the coastal, the barren ground, and some of the context down this column. I will talk about migration distances and range behaviour, calving behaviour, a little bit about genetics.

And to start, for boreal woodland caribou, migration distances in general and for most populations, especially if we consider more southern populations, they are in the order of hundreds of kilometres. So we will call that migration distance short. Whereas the barren ground and the coastal caribou tend to have longer migration distances in the order of usually hundreds to thousands of kilometres. Similarly, range size is in the order of thousands of square kilometres for boreal woodland caribou, there are exceptions, whereas the coastal and barren ground caribou are generally in the order of tens of thousands of square kilometres.

Another major difference is calving behaviour. So when we look at the boreal woodland

caribou, they calve solitary, and I will talk about that later, whereas the coastal caribou as defined usually calve en masse, which simply means that they calve together in large groups. They kind of walk in the tundra area, they walk and they drop their calves in very large groups, and then they just keep on walking, whereas the boreal woodland caribou tend to stay in one spot. And there are different behaviour strategies to try and minimize predation risks. And also, sorry, the barren ground caribou calve en masse.

Genetically, and what we know so far, and there is always continued research on genetics, is the most similar types that we know, the boreal woodland caribou are genetically similar to the coastal caribou, whereas the barren ground caribou are less similar.

Now, here is an exception and a confounding factor, when all of these animals get together and mix in a region, that's this little red dot here, where some of the coastal animals, where some of the -- either two things can happen, some of the woodland caribou types, the more sedentary types can actually get swallowed up by a bigger population that comes through, like the

traditional Pen Islands coastal animals, and disappear. There is also that behavioral possibility of animals coming back and calving in a solitary manner. So there is some confounding factors to consider when we look at the Keeyask region.

Now, this is to deal with the complexity of behaviour and the range changes over time. In the EIS we identified the fourth grouping of caribou called summer resident caribou. This was the precautionary approach that basically bridges the gap between what we understand to be regulatory for the system, and what the Aboriginal traditional knowledge says, and what science is saying. And by definition, we call the summer resident group, it can either be woodland, coastal, or both, as a precautionary measure when we looked at the EIS.

Now, given the unknowns could not be resolved over the research period, this approach looks at the groupings of animals from different perspectives to give you a better context for what is happening in that region. And we want to ensure that no inappropriate assumptions are made about the caribou.

On this map, which you haven't seen before, there are four, here are the four ranges. The bright orange up on top is the Qamanirjuaq animals coming down. This is about as far as they come, but they also have a tendency that they could push further, infrequently, and that's the orange colour. In the hatched over here we have the Cape Churchill coastal caribou. They don't usually come into the regional study area, which is bounded by this gray line, and the regional study area being zone six, but they have the possibility of pushing into, or closer to the Keeyask project.

Here in green, the most common types, we will have the Pen Islands coastal caribou. And here is the delimited distance used for the northeastern part of the regulated boreal caribou range, so it just comes into zones five and six.

Now, the key points -- and of course these ranges, all of them, extend way off the map, and that's one thing that you do have to keep in mind. They are not just restricted to this map. And they are mixing. This is probably one of the more complex areas in Manitoba that we, in fact, can consider, because the animals are mixing.

In the following slides I will give you very brief discussion of the four populations in turn, and then I will be providing you with more details about the summer resident caribou.

Now, this map shows the threatened boreal woodland caribou range in the southwestern fringe of our study area. Here you see zone five which is used for that, the hypothetical boreal woodland caribou range, which I will talk about in a little bit. Here is the caribou zone six, and the known boreal woodland caribou ranges that are recognized currently by Environment Canada and by the Province of Manitoba are the Wapisu range, and that is in the hatched purple area over here, so it occurs west of Thompson. And it can even get maybe a little more complicated than that once you start putting collars on animals, there is range splitting. In Bipole, for example, they talked about the Harding Lake population, and it was regrouped, this lower part into the Wimipedi Wapisu range. So as soon as you start putting on a lot of collars, you get a lot of complex changes. But you have got to remember, when you put collars on animals, you keep them on long enough, that range will change over time, and it

will often be reflected within the larger range of a stable eco-region. So, certainly there are several ways of looking at and assessing the potential effects on caribou and all of the other animals that we did in this environmental assessment.

This green line here is from I believe Environment Canada's north/east range extension. This blue line, I will call it an uncollared boreal woodland caribou range, and that's called Manitoba North by Environment Canada.

In the Wapisu herd, we have got about 125 animals. They are listed as threatened by SARA and MESA, and they are considered self-sustaining. The Manitoba North has an unknown number. They also have a very large range currently.

So for the boreal, the true regulated boreal woodland caribou assessment, what we anticipated and what I clarified in the information requests is what we are really looking at is an increased traffic through the Thompson area. That's the connection. So, you know, there is certainly a possibility of potential caribou vehicle collisions, which I also provided further

context for, but any connecting traffic that may be coming through Winnipeg and going through the Wapisu range, that's the limit of what the impact is on the actual regulated boreal woodland caribou. And we can not discern what those types of effects can be.

When we try and we take a look at some of the benchmarks in the literature, you know, we look at intactness, predators and habitat loss, and at that scale, for just a little bit of increased traffic, which I believe is about two vehicles per hour during the peak construction period. You won't be able to discern an effect with that.

So for the regulated boreal woodland caribou assessment, there is no adverse effects on the population.

Now, moving in that counter clockwise direction, moving from Thompson and now moving north, we are going to talk just a bit about barren ground caribou.

Now, historically, these animals in the Keeyask region, and especially based on the Aboriginal traditional knowledge, were frequently found up to Split Lake, and south on occasion of

Split Lake, up until about the 1950s, did coincide with hydroelectric development. And they have disappeared for some time. And in the last 12 years, the substantial numbers, of which there are upwards of 348,000 in what they are describing, that's the population, only about 10,000 of those animals actually get near the Keeyask area. So that's the general context of what we do, we look at, when we are looking at the barren ground caribou.

They arrived once on the north side of the river. I had the pleasure to see them from a vehicle on highway 280, and there were a lot of caribou. The numbers estimated by photographic counts on the calving grounds near Thelon game sanctuary were estimated to be in the neighbourhood of 348,000 at that time.

Now, for the barren ground caribou assessment, historically -- looking at the population as a whole, habitat loss is generally just a tiny fraction of the entire range. It is much, much less than one per cent, of course. But looking at it more critically, when they do come into our area, the winter habitat loss for the barren ground caribou would be described, and that

would be physical habitat loss only, would be less than 1 per cent.

Now, if the animals do arrive during construction, or if they happen to arrive during construction, there may be expected local altered movements with the disturbances, with the people, the machinery, the blasting. You could expect potential effects if there is increased access like occasional harvest. So this is the type of thing that you can expect, if the barren ground caribou do arrive.

Now, the Cape Churchill animals, if you will, now we are continuing clockwise, is in the northeastern portion of the study area. And their distribution is really limited winter use possibly of the Keeyask region. We had hypothesized earlier on, and we have been working at this since 2001, that maybe the Cape Churchill animals do come into the study area. With radio collaring, as you can see on this map, and this is directly from the Bipole product, here you can see the Hudson Bay, Nelson River down over here. And then of course once you get the collars on the animals, I believe this map was from about 20 collared animals between 2010 and 2011, so each

one of these dots is a fix. And if you put a boundary around all of these dots, you can basically see the range extent, and that range extent actually agrees very closely with the map that we had incorporated into the Environmental Impact Statement.

Now, their abundance is increasing since about the 1960s. There is estimated to be about 3,500 animals to 5,000 animals today. Cumulatively, there is only overlap with region six. So the effects may be limited to some harvest by workers that may come into the area, and if they do go north, may encounter them. Of course, there is a limited number of licences that are associated with the Cape Churchill herd, I think there is 10 licences, but you can question the socio-economic folks in the next panel.

And of course, no adverse effect as a result is certainly expected with these numbers and animals, and potential harvest associated with the Keeyask project.

Now, Pen Islands animals are definitely the ones that are in the main areas of interest. They are the most common group. Their range occurs from Ontario to Manitoba, and they

occur in summer and in winter.

Now, traditionally this is the group of animals that calve en masse along the Hudson Bay coastline. But there have been recent discussions in the literature including, Thompson and Abrams, about these animals moving inland, away from the coast.

Similarly, here you can see numbers of fixes with radio collared animals, what their general distribution is. Some of the animals cross the Nelson River, very few, but some definitely do, and they come into our area of interest. And I don't know if you can see very well, but where my cursor is, that's where Stephens Lake is. And that would give you some context of where these collared animals are actually ending up.

The Pen Islands caribou population trends that we know of from western science, and that's since 1979, have increased from about 2,300 animals, and of the photographic counts that they had just last year, there were 16,600 animals. So the trends are increasing.

In the study area itself there is a large variation in numbers that we have witnessed

between -- since I first hit the ground running in 2001, even to this year, and we even had a supplementary filing. So we have measured the variation of the Pen Islands animals that have come into the area from zero in winter to about 14,000 animals this past February.

Now, as indicated, and similarly for the barren ground caribou, the potential project effects with spatial and temporal overlaps with the project, there are during construction and operation, and that's what is discussed, with physical habitat losses and effective winter habitat losses, we are looking at less than one per cent of the region.

Now, similarly, we have to consider altered movements during the construction with the noises and the people and the machinery. And if access, of course, is increased, and that's with the addition of the road, as we are familiar with, through from Gillam, crossing the dam and connecting with the Keeyask infrastructure project, or north access road, in that area there is certainly going to be now a drivable area between -- connecting highway 280, which I would consider increased access. However, there is an

existing trail system there, and certainly people are using that trail now to access their traditional lands, and to practice and harvest animals. But there is increased access as soon as you put in that road and it is drivable.

Finally, as you may recall, is this summer resident grouping, and it's defined basically as woodland caribou, coastal caribou or both. Now, what is common to both of these animals is that they occur in summer, at least with respect to the collared Pen Islands coastal animals, and that these animals calve by themselves, at least for now. That's what we know about their behaviour.

Now, if we think about what potential size is for summer residents, there would be about 20 to 50 animals in the local study area. I believe that the Fox Lake environmental evaluation report also suggests 50 animals. I'm a little unclear as to what the area of reference to that is, but they are saying 50 animals. But if you start looking at the region and what there might be for the potential for more animals, I believe it would go up to 73 to 150, at least if we consider zone five.

Now, for assessment purposes, when we are considering summer residents as a woodland caribou population in zone five, I think that zone five, as is suggested in the literature, you want to keep that range smaller. So definitely it is smaller than what was selected for the regional assessment for all caribou in zone six. And what we have to consider also is that for the Pen Islands caribou, with some of the potential behavioral changes that may be occurring, their zone moves outside and east of our extended study area.

Now, for what the caribou use and what is common to the animals in the region are these nice photos that I was able to find, and these are what is important for the calving and rearing. Many islands are used, and the numbers do tend to vary. We have a range of about 10 to 50 per cent over the years of study, but we also have to remember that peat land complexes are important for calving. So here at the bottom photo we are seeing an island in the lake. And you can imagine that caribou move out, either they can move out ice on or ice off, it is cutting it close, but that's when they go. And they will end up on this

island and they are protected from predators. If you envision a peat land complex such as this as being that island in the lower picture, it is surrounded by this really wet peat land, and you can imagine this almost being water, you can even see bits of water here. That also affords the protection to the caribou, affords protection to caribou because it protects them from predators and the wolves that may cross from dryer areas such as this to try and get them. So that's what this complex is, a number of islands within a large area that is surrounded by really, really wet.

This map is in the Environmental Impact Statement. Calving habitat distribution, there certainly are fewer islands overall in region five. There is a lot more peat land complexes in regions five and six, they extend well off in the eco region. And when there was actually a net increase of the island habitat that was formed by Stephens Lake when Kettle Generating Station was formed, of about 10 square kilometres. Now, that does not account for the peat land complexes that may have been flooded, but in terms of island suitability, the number of islands,

actually the total number of islands went down. And the area of the islands went up by about 10 square kilometres.

Stephens Lake was used as the proxy for understanding what is going to be considered when the Keeyask reservoir floods. It is a project when the project goes ahead.

Now, this is what it looks like, the caribou islands post reservoir. This is a map that you have also seen in the Environmental Impact Statement, just coloured a little bit different. I wanted to pop the colours a little bit. Here in green, these are the islands that are created by the reservoir. The orange colour, that's the flooded portion of what are the existing islands. And the impoundment period of reservoir at year 30 is represented by the dark blue.

There will end up being more islands in total, they are probably going to be slightly smaller than average size.

Now, based on what occurred at Stephens Lake reservoir, it is likely that the islands, as shown in green, are in fact going to be used by caribou. Here is Caribou Island, its

core area does get reduced. However, it is still going to be a substantial sized island, and it is highly likely going to be used by caribou into the future.

Now, here is an example of how peat land calving habitat is used relative to other generating stations. I just wanted to touch on this. When we did our tracking studies, where we were working with our First Nations, we were working with our partners, and we would go out to these spots which are really, really wet. We would wade through the water at times up to our chest to get on some of these calving islands, and we would be doing tracking studies, and we would get a lot of caribou use on these brown coloured islands within this peat land complex.

Here is one just north of Long Spruce, and for illustrative purposes, we grabbed one of the collared animals that Conservation has information on, and Manitoba Hydro has information on. Just for demonstration purposes, in spring 2011, if you can see my cursor down here, it started off south between the -- into the Long Spruce reservoir, and it travelled along, crossed the highway, crossed another complex, crossed the

Limestone reservoir, crossed the highway, and ended up in one of these peat land complexes between the highway and the existing railway tracks, and spent about two months where it calved. Then it moved off towards the northwest.

Now, what will be some of the key effects of the project for the summer resident caribou? Island habitat is expected to develop and be used by caribou, based on our understanding of how the Stephens Lake reservoir is, in fact, used today by caribou. But there will be a small loss of that caribou habitat in total, both in terms of islands and with peat land complexes extending, including future projects. A few large core areas are going to get smaller, but they should be large enough to support calving. Construction disturbances with people and machinery, that will result in the effective habitat loss, but these disturbances are expected to decrease during the operation period. And as James described, before I get to the benchmarks to reiterate, linear feature density will not change, but highway access, as I already described, will increase.

Wherever possible mitigation measures

were recommended to minimize all of the potential aspects of the project related effects. Here is just a list of mitigation measures embedded, which ranged from the project planning process, notably the first two points, right down to what James -- Dr. Ehnes described using fire prevention methods to minimize the potential habitat loss.

So for the caribou assessment and interactions with future projects, we did consider Keeyask, Bipole -- sorry, Keeyask transmission, Bipole, Gillam redevelopment, Conawapa, and as context some of the caribou populations are increasing or potentially decreasing. The Pen Islands coastal animals have been increasing over the past 40 years -- my apologies, the Beverly Qamanirjuaq animals have been highly variable, but they have potential decline over time, but they are still very plentiful. There have been historic changes to range and number of animals overlapping Keeyask, and there is some uncertainty regarding the population designations that I have described. But regardless however the caribou are grouped, the benchmarks used for the effects assessment include island and winter habitat, wolf density, linear features and intactness, which I

will outline next.

Now, just in terms of orienting you to this particular figure titled Loss of Islands and Peat Land Complexes for Caribou Calving and rearing, here on the left, and you will see variations on what this number is. This is in hectares, along the bottom, starting off with existing cumulative effects. And in the middle you will see plus Keeyask. On the right you will see Keeyask, and existing and future projects. On the right you are going to see the benchmarks used, low, moderate, high, less than one, one to ten, ten. Those will change throughout the slides that I'm about to show you.

So here for example, the loss of the calving and rearing habitat in the region is expected to be much smaller than one per cent of the habitat cumulatively over time, and falls into that low benchmark range.

Here for the caribou winter habitat, the potential loss of physical winter habitat, that mature coniferous forest, and we are just talking physical habitat loss, is about in the one per cent range in zone five, and less than one per cent for our caribou regional study area.

For wolf density, and remember it is the important association between what could happen and has the potential to substantively affect caribou populations, the first thing I would like to note is that these benchmarks are reversed, so now we are going now from low to high, bottom to top. And we established our benchmark at four wolves per thousand square kilometres. And we believe that the wolf densities throughout are not expected to change because they are predominantly limited by what is available in terms of the moose biomass.

And part of that discussion that Dr. Brian Knudsen produced is located in the technical report, the moose harvest sustainability plan and the technical report.

The Split Lake resource management area wolf densities are one of the lowest probably anywhere that you can find in the literature. And as such, total wolf predation on caribou should remain low as long as the moose population doesn't go up, or the overall ungulate biomass doesn't go up, or if the linear features substantially increase.

Now, neither of those are predicted

cumulatively with present and future projects.

Here is what the linear feature density is, and this is actually the same measures as Dr. Ehnes was using, but we set our benchmark for linear feature density at .06, which indicates that this area is still in the low range for caribou.

And drawing your attention to the caribou intactness map, Dr. Ehnes also has the intactness VEC, this one is developed specifically for our caribou and this is extended over zone five for woodland caribou population, if there were animals all throughout this region. And you will notice it looks different than his map because of a couple of things. Well, one primary reason is these purple blobs over here, and those are fires, and that demonstrates habitat that is less than 40 years old. Secondly, we have got the 500 metre buffers applied similar to what Environment Canada does in their modeling process.

Now, if hypothetically a boreal woodland caribou population were, let's say to be declared for this area, this would be a population that would have one of the lowest cumulative disturbance intactness rankings compared to all of

our other regulated and recognized listed boreal woodland caribou herds in Manitoba. And conversely, throughout this area, it would have maybe one of the higher or highest, I think it was one of the top three natural fire disturbance regimes compared to the real, or the listed SARA and MESA caribou.

As I mentioned earlier, we did some exploratory analysis of additional studies with knowledge of some of the collared animals with respect to the Pen Islands coastal summer, and this is one of the maps that was produced from the Bipole assessment. No changes. There is a cumulative disturbance across the Pen Islands evaluation area, and as you can see with the animals used to produce this understanding of what the Pen Islands evaluation area was, what we can see is that it does contain, as Dr. Ehnes also pointed out, less fire as we go further east. And that's not surprising as the ecological boundary changed. But any caribou using this range, and as they start moving beyond zone five east, would be measured against an intactness benchmark of up to 8 per cent. So it really goes up once you start considering movements of animals across what they

are actually doing in the Keeyask area. So when we examine the Environment Canada intactness benchmark for woodland or coastal caribou, which are the summer residents, here again we have reversed the intactness indicator, up on top in the green you will see the low at less than 65, moderate being 55 to 65, and the high being less than 55 per cent. And looking at it from three different perspectives, what we can see when we consider a smaller range for boreal woodland caribou population, if there would be one there, is study zone five, and it starts off right at that 65 per cent intactness benchmark. That's where we are at. And with Keeyask, it would reduce it slightly more, and with future projects, slightly more, I think that's 63 per cent right there.

For zone six, which is our regional caribou study area, which would be an appropriate size, I believe, to use for all caribou types, and considering the complex range of behaviours that are occurring in there, then considering the size of the fire regime, this brown is the top of the mark, so you can imagine going from blue all the way up to the brown, that's the size of study zone

six. And it starts off above that 65 per cent, it is over 66 per cent with the existing cumulative effects, and Keeyask would add to that, and with future projects it does stay above that 65 per cent.

Now, knowing that there are animals in our area of interest that do move and use a totally different range, but they still use part of our area, the Pen Islands evaluation area, we are starting off at a much higher benchmark, upwards of 73 per cent, and it goes down to about 71 per cent.

So lets summarize all of the evidence that we have looked at. We have four of the five measurable indicators were in the low range with respect to cumulative effects, and I don't believe they are likely near the ecological thresholds that would truly put a caribou population into decline. I think the intactness indicator here suggests that we are close to or exceeding that actionable benchmark that Environment Canada uses if there would be a listed boreal woodland caribou in the area, in the local study area. But we also know that Environment Canada indicates that that fire disturbance is to be of a medium level of

concern and of moderate severity compared to two things, and that's land use activities and predators, which are considered to be higher risk for caribou.

And what we have pointed out earlier in this presentation is that the total habitat affected by fire in the landscape appears to be high, but we consider fire skips, and there could be some unburnt habitat still left in those areas of various sizes that wildlife can use.

Now, this intactness benchmark extends all the way up to Thompson, if this area is included, but if we don't include the Thompson area, it gets reduced.

Now, there is some precedent for the maintenance of these caribou populations over time, even if this Environment Canada intactness mark would be exceeded. We have seen persistence, even though they are prescribed to be between self-sustaining and not self-sustaining, have persisted for 30 years or more from some of the southern ranges that we have looked at.

And finally, we are certain that if any of the actual portion of the range extends east, as it does and is demonstrated by the

collared animals in the area, the intactness benchmark improves.

So in conclusion for caribou, we can say with more confidence that Keeyask, in combination with future projects, is not expected to substantially affect the caribou regional populations.

At this time my next slide -- or I should say in conclusion, as I had already described, I have about ten more slides to go, and possibly up to 20, 25 minutes. Would the Commission suggest that we break or would you like to push through to the end?

THE CHAIRMAN: Normally I would say push through to the end, but I have a commitment this evening, so I think we will cut it now and come back in the morning.

MR. BERGER: Thank you. I apologize for extending it for as long as I did, sir.

THE CHAIRMAN: That's okay. No need for an apology, we will take the time.

MR. BERGER: Thank you very much.

THE CHAIRMAN: I think we have one document to be registered.

MS. JOHNSON: Yes, the terrestrial

presentation is KHLP 42.

(EXHIBIT KHLP42: Terrestrial presentation)

THE CHAIRMAN: Thank you. We are adjourned until 9:30 tomorrow morning.

(Adjourned at 4:36 p.m.)

OFFICIAL EXAMINER'S CERTIFICATE

Cecelia Reid and Debra Kot, duly appointed Official Examiners in the Province of Manitoba, do hereby certify the foregoing pages are a true and correct transcript of my Stenotype notes as taken by us at the time and place hereinbefore stated to the best of our skill and ability.

Cecelia Reid

Official Examiner, Q.B.

Debra Kot

Official Examiner Q.B.

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