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* *

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Roy Beardy

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No undertakings given

Tuesday, October 29, 2013

Upon commencing at 9:30 a.m.

THE CHAIRMAN: Good morning. Welcome back to another day in -- the appropriate word has escaped me right now, but I believe the partnership has an undertaking to report?

MR. LONDON: I do, Mr. Chairman. On the 22nd we undertook to inquire and produce the summary of meeting with member 2, if available. And we have delivered the notes of that meeting to Ms. Pawlowska-Mainville, who had requested it, and she's satisfied with the satisfaction of the undertaking.

THE CHAIRMAN: Did you deliver it to all parties?

MR. LONDON: I didn't. I delivered it to her. She was the only one who seemed to be interested in it.

THE CHAIRMAN: Our standard practice is to make it available to all participants.

MR. LONDON: I'm happy to do that. It turns out not to have been relevant, but I'm happy to do that.

THE CHAIRMAN: Thank you. Thank you, Mr. London.

This morning we have the aquatic environmental assessment. Mr. Davies, you're chairing this panel?

MR. DAVIES: Yes.

THE CHAIRMAN: I think two or three of you have been sworn in. Others on the front table will need to be sworn in, and then I'd ask you to introduce your back table.

MS. JOHNSON: Okay. Those that haven't been sworn in, could you please state your names for the record, please?

MR. BERGER: Robert Berger.

MS. MATKOWSKI: Shelley Matkowski.

MS. SCHNEIDER-VIEIRA: Friederike Schneider-Vieira.

MR. DAVIES: Stu Davies.

MS. WYENBERG: Leane Wyenberg.

Robert Berger: Sworn.

Shelley Matkowski: Sworn.

Friederike Schneider-Vieira: Sworn.

Stuart Davies: Sworn.

Leane Wyenberg: Sworn.

MS. JOHNSON: Thank you.

THE CHAIRMAN: If you could introduce your back table, Mr. Davies, and then proceed with

your presentations?

MR. DAVIES: I have asked each individual to raise their hands so they can be identified. Marc St. Laurent for Manitoba Hydro; Nick Barnes, Manitoba Hydro; Brock Epp with Ecostem; Pete Hettinga with Wildlife Resource Consulting Services; Blair McMahon with Stantec, Megan Cooley with North/South Consultants; Dr. Cam Barth with North/South Consultants; and Dr. Wolfgang Jansen with North/South Consultants.

If anyone has trouble hearing my voice, I've been accused of speaking too lowly, so please let me know.

THE CHAIRMAN: You might want to pull the mic closer if you can.

MR. DAVIES: We will try to make this more exciting than yesterday's presentation, though.

THE CHAIRMAN: Are you commenting on the quality of yesterday's presentation?

MR. DAVIES: It was excellent but we --

THE CHAIRMAN: You are going to be even better.

MR. DAVIES: That's right.

THE CHAIRMAN: We're glad to hear that.

MR. DAVIES: Good morning and thank you for the opportunity to describe the effects of the Keeyask generation project on the aquatic and terrestrial environments, and the mitigation that's been developed to manage those effects.

To accommodate the schedule of some of the experts for the participants, we had been asked to start with the aquatic environment presentation, follow up with the aquatic questions, and then we'll follow with the presentations for the terrestrial environment and the terrestrial questions.

So I'd like to introduce the panel members and presenters. The first is Dr. Friederike Schneider-Vieira, who we referred to as Rika for obvious reasons. She's going to be responsible for the aquatic environment portion of the Environmental Impact Statement and will be providing a presentation on that component. She is the vice-president of North/South Consultants and has worked as an aquatic scientist for the past 24 years in Manitoba and in Canada.

Shelley Matkowski is a senior

environmental specialist at Manitoba Hydro. She oversees Manitoba Hydro's Lake Sturgeon stewardship program and will be providing a presentation on lake stewardship in Manitoba. Shelley has worked as a fisheries biologist for the past 29 years.

Dr. James Ehnes, who we met yesterday, has been responsible for the terrestrial ecosystem, habitat and plants portion of the EIS, and will be providing a presentation on those components in the overall terrestrial approach. He's the president of Ecostem and has worked as a terrestrial ecologist for the past 16 years.

Leane Wyenberg with Stantec has been responsible for the bird, amphibian and insect components of the Environmental Impact Statement, and will be providing a presentation on those components, as well as mercury and wildlife. Leane is a project manager at Stantec and has worked as a wildlife biologist for over 10 years.

Robert Berger with Wildlife Resource Consulting Services has been responsible for the mammal component of the EIS and will be making a presentation on that component. Rob is the president of Wildlife Resource Consulting Services

and has over 20 years of experience as a senior wildlife biologist.

Dr. Brian Knudsen, who unfortunately can't be with us right now. He had an emergency dental surgery this morning but hopes to come later this afternoon. He was responsible for the moose modeling component of the EIS and will be responding to questions on that. He's worked as a wildlife manager for approximately 30 years.

And I'm Stuart Davies. My presentation today is to provide some background on the aquatic and terrestrial assessments for the Keeyask generation project. I'm the president of North/South Consultants and have worked in the aquatic field for about 40 years, actually a little over 40 years, most of which has been spent on environmental assessments and environmental monitoring programs of hydroelectric stations in Manitoba and across Canada.

Actually, I missed one thing. This panel is actually the third panel under the regulatory environmental assessment component and will be followed by the socio-economic resource use and heritage resources panel.

In addition to the panel members,

there are a large number of technical experts on the study team who provided their expertise in specific topics such as water quality, lake sturgeon, mercury, soil statistics and many other areas. The study team has used senior experts with direct experience in Northern Manitoba for each major component. These individuals included experts from Manitoba Hydro, the First Nation Partners, and the consulting community.

When additional expertise was required, the study team worked with other organizations to try to fill those gaps. University of Manitoba was particularly helpful. They conducted research on the use of hormones to promote reproduction in sturgeon, and are currently working on methods of marking sturgeon using isotopes to allow us to identify sturgeon that are too small to be tagged.

The University of Laval is a leader in the field of genetics and they assisted us greatly with the lake sturgeon genetic studies. Trent University is similar but specializes in caribou genetics and they assisted the mammal team with that component.

We also worked a lot with the Rainy

River First Nation. They have a long running and successful lake sturgeon hatchery. They provided a large amount of expertise to us and even assisted us with the collection of eggs in the Keeyask study area.

Now, the environmental assessment is a number of different areas of knowledge and assessment tools, including Aboriginal traditional knowledge, local knowledge, historical technical information, technical field studies specific to Keeyask, the use of proxies, and the use of models. Where possible we tried to use more than one of the above and the results were compared to improve certainty. An example of that was the water quality analysis.

In regard to ATK, ATK was used throughout the environmental assessment, as discussed in the approach methods and process panel. Additional information on the ATK process will also be provided by the First Nation Partners' environmental evaluation approach and process panel, which will come after the socio-economic panel.

Local knowledge was also used extensively throughout the assessment. I had

mentioned earlier, on Monday I believe, that on the previous panel that about 105 First Nation members and local residents participated in the field studies and shared their expert knowledge of the environment with the field technicians, biologists and engineers. A total of about 3,600 person weeks or 144,000 hours of their time was spent working side-by-side in the field with Manitoba Hydro and the consulting team.

The First Nation Partners also provided considerable input through aquatic and mammal working groups. They were fully engaged in the field studies, which substantially assisted the study team and provided the communities with a better understanding of the types of studies that were being conducted in their area.

In addition to the field work, there were also several First Nation members who assisted the study team, as part of the study team on the assessment with us in Winnipeg, as well as on other projects. One Fox Lake Cree Nation member, who was a university student, worked out of our office for three summers, processing information on Keeyask, as well as conducting field work on lake sturgeon in Manitoba,

Saskatchewan and Alberta.

A TCN student assisted us with benthic invertebrate lab work. The York Factory member worked on Keeyask and other projects out of Winnipeg for several seasons. And this year a young TCN student worked with us for part of the summer and probably saw more gill nets than he ever wanted to see in his life.

Overall, a great deal of knowledge was gained from the First Nation partners that were working on the project, and very positive working relationships were developed between the First Nation members and the Winnipeg staff, some of whom have now been working together for over 10 years.

One thing that's important to note is that the lower Nelson River is actually one of the most heavily studied areas in Canada. In addition to the ATK that was provided by the First Nation Partners, the scientific information and knowledge gained over the past 40 years provided the study team with a better understanding of the potential effects of Keeyask on the environment, and in some cases provided the historical context for the VECs.

One of the largest studies was conducted by the Lake Winnipeg, Churchill and Nelson River Study Board from 1971 to 1975. This was a broad scale environmental assessment conducted by the Department of Fisheries and Oceans, Department of the Environment, Manitoba universities, and a number of consultants. The studies were conducted over a period of five years and a 10,000 page Environmental Impact Statement was produced. The studies were state of the art for their day, and a large amount of the information collected is still valid today, including some of the first information that was available on the link between flooding and mercury.

Mercury has been and continues to be a concern in northern communities. Actually, one of the reasons that it's such a concern is that when the Government of Canada made a video, there wasn't a Cree word for mercury, so they used the word poison. And the video came out with the word that your fish have poison. And so it became a concern for all of the First Nations that have been affected. And it's still a very large concern in the communities. Because of that, a

great deal of information has been collected on mercury in fish in Manitoba. It is one of the largest and most complete databases in existence and is used by other utilities in Canada. As of 2012, about 80,000 fish had been sampled for mercury from 400 water bodies in Manitoba. Mercury samples had been collected almost continuously from 1975 to present. There are actually some samples that were collected prior to 1975, but they were collected in relation to the chlorakalkali plants that were putting mercury into the system through the Winnipeg River.

And the map that's in front of us right now, we refer to that as the measles map for obvious reasons. But it does provide an overview of the number of water bodies that have been sampled for mercury since 1975, and it's clearly very good coverage, particularly in the area of interest.

Until Wuskwatim, the Limestone Generating Station was the last major generating station constructed by Manitoba Hydro. Environmental assessment studies were conducted from 1985 to 1992, and environmental monitoring studies from 1993 to 2003. The study program

assembled a long-term database to verify predicted impacts, identify unpredicted impacts, and managed those impacts. Over 70 reports were published on the monitoring program, and a final report integrating the results of all of the studies has been produced.

We had mentioned the Lake Winnipeg/Churchill Nelson River Study Board. They made a number of recommendations in 1975 in their summary document. And one of the recommendations was recommendation number 10, and that was that the appropriate government agencies were to provide long-term monitoring in relation to the CRD and LWR.

A claim was filed by the Northern Flood Committee, that was called claim 18, alleging that insufficient monitoring had occurred. And this was the case, and this lead to a monitoring program being conducted by both Manitoba and Canada, two separate programs, but coordinated.

The Federal ecological monitoring program went from 1986 to 1992. It was a five-year study program conducted by the Department of Fisheries and Oceans and the

Department of the Environment. The results were provided in a series of over 20 reports, as well as a videotape called "Changes" which was produced in Cree and in English. A separate report was written in 1992 for the Government of Canada by Randy Baker and myself that provided a review and synthesis of all available information on the physical, chemical, and biological effects of the Churchill River Diversion and Lake Winnipeg Regulation on the aquatic environment. The report focused on the resource areas of the signatories to the Northern Flood Agreement.

The Manitoba ecological monitoring program actually got started a year earlier in 1985, and Manitoba and Canada worked together to avoid duplication of effort. Manitoba focused their efforts on several lakes, including Split Lake and Stephens Lake, which provided us with a great deal of information.

One of the most relevant studies undertaken for the Keeyask generation project was the Split Lake post project environmental review. It covered an area that was actually slightly larger than the Split Lake resource management area. It was approximately 5 million hectares in

size. The study was used extensively in the Environmental Impact Statement. It was conducted jointly by TCN, then called Split Lake Cree, and Manitoba Hydro between 1992 and 1996, and looked at the effects of all of Manitoba Hydro's facilities, not just the generating stations, using ATK and science.

In 1996, a series of reports were produced, including analysis of change, history and first order effects, environmental matrices, environmental baseline evaluation, summary and conclusions, and both ATK and technical information were used jointly throughout the development of the reports. Both had equal value and both parties signed off on the final post project environmental review.

CAMP. During the Wuskwatim hearings the Clean Environment Commission expressed concerns regarding the scope of Manitoba Hydro's monitoring programs. The same concerns were expressed by several communities under the section 35 process. For Wuskwatim, the coordinated aquatic monitoring program, which is referred to as CAMP, was undertaken by Manitoba and Manitoba Hydro through a memorandum of understanding to

address those concerns. Manitoba and Manitoba Hydro, with input from Department of Fisheries and Oceans, the Department of the Environment, the University of Manitoba, consultants, external experts -- one of the external experts was one actually that worked on the original Lake Winnipeg/Churchill/Nelson River Study Board report -- designed the coordinated aquatic monitoring program, which was implemented in 2008 and remains ongoing. The program includes all areas affected by Manitoba Hydro's hydroelectric facilities in Manitoba, including the Keeyask area.

The primary objective is to provide long-term environmental data on waterways affected by Manitoba Hydro's existing hydraulic system. The information is being collected on aquatic habitat, water quality, lower trophic levels, which includes phytoplankton, benthic invertebrates, fish populations and fish mercury levels.

This map shows the various areas that are being covered by CAMP. As previously noted, it is a provincial-wide program, basically from the top right to the Churchill estuary. And one

of the main advantages of the program is that all of the parameters in all of the areas, both on system and off system, are being sampled in exactly the same way every year, which makes it much easier for comparisons, both spatially and temporally.

There has also been a very large number of other studies conducted by Manitoba, Manitoba Hydro and Canada, and the First Nations. And the majority of these have been what they would call site specific studies. And this is a map, a first map showing sort of the large number of studies that were conducted. And if we look at -- I'm going to use my pointer here -- each one of these symbols represents a different type of study, whether it's fish, aquatic, fur bearer studies, bird studies, mercury studies, lower trophic level studies, ungulate studies, or water quality studies.

In some cases, the studies were multi-disciplinary and may have more than one component in them. In other cases, if we take a look at Cross Lake and we see one fish -- sorry, one fish, it could actually mean that that's the study that was conducted from 1992 to present.

It's the 20-year study on fish populations after the Cross Lake River was put in place. So a single dot can actually represent a 20-year program. It's been conducted for the entire CRD/LWR route.

And this is the area that we're currently concerned, and as you can see, there's a large amount of scientific knowledge that gives us a good understanding of the types of effects of hydroelectric developments. That said, it should be noted that the majority of studies that are contained on these maps were conducted post project, and in many cases they used different sampling methods, which makes qualitative, quantitative comparisons difficult. ATK was invaluable in providing the long-term information on the environment and the coordinated aquatic monitoring program now has addressed the methodology issue.

Keeyask field studies: Field studies were conducted for over 10 years, which is the longest period of pre project studies conducted on a hydroelectric project on Manitoba to date. Studies were conducted to provide information on the aquatic and terrestrial environments for the

environmental assessment of the Keeyask generation project, address concerns raised by the First Nation Partners and others, and provide a basis for comparing pre and post project conditions. The First Nation partners recommended a number of the studies and participated in the review of all study plans.

We also used proxies and models, and using a proxy is essentially using information from a similar environment that was affected by a similar project. For example, the water quality assessment used information from several similar reservoirs to help predict changes in water quality.

Models, various types of models were developed, ranging from simple to complex, and were used in the assessment. A mass balance model was used to help predict changes in water quality, and the results were compared to the information from the reservoirs using the proxies, again, to increase certainty.

The use of proxies and models will be provided in the following presentations by the technical specialists.

As noted at the beginning of the

presentation, the next individual to speak will be Dr. Friederike Schneider-Vieira on the aquatic environment, followed by Shelley Matkowski on sturgeon, and Rika will actually come back to finish the presentation after Shelley.

At that point, we will be happy to respond to any questions that you may have. And thank you very much.

THE CHAIRMAN: Thank you, Mr. Davies.

MR. DAVIES: We're going to play a bit of musical chairs because we have a pointer that we use.

THE CHAIRMAN: Okay, go ahead.

MS. SCHNEIDER-VIEIRA: Good morning Commissioner and others.

As Mr. Davies just indicated, my name is Friederike Schneider-Vieira and I will be presenting to you a summary basically of the work that we have done over the last decade on the aquatic environment. I am going to be going through most of the aquatic components of the aquatic environment, and then when we reach sturgeon, I will take a break and Shelley Matkowski will present to you sort of an overview of lake sturgeon stewardship in Manitoba, before I

come back and finish off with the Keeyask specific sturgeon effects.

And sometime around that time too, Mr. Chair, may be a good time for a break.

Now, this is an outline of my presentation. I'm going to start off with an overview of the aquatic studies, followed by describing the existing conditions, effects assessment, and mitigation, for a few of the key components, that is water quality, aquatic habitat, plants and invertebrates. The fish community focusing on Walleye, Lake Whitefish and Northern Pike, and with some information on mercury in fish flesh, followed by lake sturgeon, where Shelley will come and provide her overview, followed by a description of the Keeyask effects. And we'll conclude the presentation today with a summary of our proposed monitoring and follow-up program.

Looking first then at the overview of aquatic studies. Now, the first question that many people ask is, how do you figure out what to study? And the answer is that we consider the ecosystem that we have now and how it connects to the project that's being considered in the

assessment.

Now, I'm going to use my little pointer. So this is a very simple picture of the Gull Lake ecosystem, and it's a conceptual diagram but I think it helps people who are not technical understand how we go about structuring our studies. For example, we have here the sun, and through its energy shown here by this arrow, that energy taken up by plants growing along the edge of our water. And those plants are either eaten directly or they die and decompose -- and they are what is called deritus -- enters the food chain by being consumed by little bugs. Those bugs are eaten by little fish and those fish are then eaten by larger fish. So this is just a very simple little food chain that we have.

You can see here I've shown a Northern Pike, or commonly known as jack fish, in the shallow water. And this is a species that is dependent on our shallow water or littoral environments, and so we often view it as a good indicator of what's happening in these shallow water systems.

A Pike is also a good indicator because it's what we call a top level predator.

You can see that it is relying not only on the fish it eats, but on the bugs that feed those fish, and on the plants and algae that feed the little bugs. So looking at Pike also tells you what is happening in all of these environmental components.

Now, looking at other parts of our aquatic ecosystem, going out here to the deep part of the lake, we have, for example, a Walleye, which is more commonly known to fishermen as pickerel. This is actually a species that uses both shallow and deep environments, and it is another top level predator and is a good example of more generalist species.

We also have here in our diagram lake whitefish. They live on the open water, they eat bugs on the bottom of the lake. They are a mid level predator. They are not usually fish eaters, they normally eat just bugs. They are a very sensitive species. They are very sensitive, for example, to adverse water quality conditions, and so they are considered a very good indicator species.

Finally, we also show you at various places in our diagram lake sturgeon. We've got

here a sturgeon that is living in the middle of the deep part of the lake and it's eating bugs from the bottom. You can see that sturgeon are different from any of the other species in our lake in that they require large rapids in which to spawn. So here, for example, and here you can see a sturgeon, and there are some eggs on these large rocks which is representative of the rapids environments.

The other thing which we've put into this diagram is a little red area, an area here called droughts and floods, a little circle here that says Water Levels, and another area called Ice Processes. And we have put these here to remind all of us is that in natural ecosystems, you can also have what are called disturbances. We often think of disturbances as something that humans do, and that's true. But there are also natural disturbances such as droughts and floods, high water periods, low water periods, changes in water levels, and ice, which basically disrupt the aquatic environment. And those disruptions are a necessary part of the environment to which the flora and the fauna in that environment have become adapted.

Now, moving on then, the next step when we're thinking about what to study is we say, well, that is natural ecosystem that we have. What will happen then when we are looking at how the environment is changed by the project? So this is just a diagram, we have just put in this area here, it shows a dam built on the rapids. It also shows that the water levels are now much higher. We have some flooding and erosion along the shorelines here. But you can see that many of the same pathways still exist as in the natural environments. And so we need to ask the question, how have these pathways changed? So here once again you have plants. And one of the things that we would ask then is -- the plants that used to exist on the lake were flooded out, they are no longer there -- how will this new environment be able to support plants which form the basis of the food chain in this littoral habitat. And you may recall that this littoral habitat supported little bugs, little fish, and ultimately pike.

We also would be looking at specific habitat effects. For example, the sturgeon down here, we've just shown it going up to the dam. The habitat that it used to spawn on is no longer

there. So in doing our assessment, we have to consider what habitat was lost. Obviously, the sturgeon up here still have some spawning habitat, so what does that mean, and how will that guide what kind of mitigation we have to do for the project?

This is a slide of both the valued ecosystem components and the supporting topics that we considered in our assessment and that I will be describing to you today.

The first VEC, or valued environmental component, is water quality. Water quality was selected as a VEC because it is fundamental to aquatic life, and a major pathway by which project effects are linked to other parts of the aquatic ecosystem. It is one of the main concerns for the First Nations, and is also subject to regulatory guidelines. Both Manitoba and Canada have guidelines for changes to water quality.

Walleye, which as I mentioned was also known as pickerel, is a fish species. It was selected as a VEC, because as I pointed out on the diagram, it's a top level predator that uses both the near shore and offshore environments. It provides a general indication of conditions in the

aquatic ecosystem and it's also very important to the domestic, commercial and recreational fisheries. Like all fishes, it and its habitat is also subject to protection under the Federal Fisheries Act.

The next valued environmental component is Lake Whitefish. Lake Whitefish, as I mentioned, are particularly sensitive to changes to the environment such as disruptions to water quality. They have also been demonstrated in some environments to be very sensitive to the effects of hydroelectric development, because they lay their eggs on reefs in lakes and in rivers. And in the winter when some reservoirs experience significant draw down, that is the water level declines. Those eggs can become exposed, and so they basically do not successfully reproduce.

It's also important to the First Nations as a domestic fish. In some places, it's also important for the commercial fishery, though that is not the case in the Keeyask area.

Northern Pike, also known as jack fish, as I already mentioned, are reliant on the shallow water littoral habitat that is often the most negatively affected by water level regulation

in a reservoir. As a top level predator, it's a good indicator of near shore habitats. It is also targeted in the domestic, commercial and recreational fisheries.

Finally, lake sturgeon are particularly vulnerable to the effects of hydroelectric development as a result of their low population numbers and specific habitat requirements. I pointed out in the diagram that they require large rapids for spawning, and it is in many ways their misfortune that hydroelectric generation also does very well in large rapids, because it's a place where there's a very large change in the water elevation. They are also culturally and spiritually important to First Nations, and they are also a very important part of the domestic harvest. They have special status as a heritage species in Manitoba and are being -- they were assessed as endangered by the committee on the Status of Endangered Wildlife in Canada, or COSEWIC, and are being considered for protection under the Federal Species at Risk Act. Lake sturgeon is one of the species of greatest concern for the Keeyask project and as such has been the focus of considerable study and mitigation

planning. Effects to lake sturgeon may also be indicative of effects to other species dependent on riverine environments.

Now, looking at the supporting topics, these were not VECs but they were a very important part of the assessment. And in some ways, we spent almost equal amounts of time on them, because in order to understand the effects to the VECs, we need to understand the effects to our supporting topics.

The first one is aquatic habitat, which is required to determine the effects to fish species. Changes in aquatic habitat are one of the main causes for changes in the fish community.

The next two are what we often group as lower trophic levels. Mr. Davies already used that term. These are food-based fish species, and that is algae, aquatic plants, zooplankton and benthic invertebrates. The fish community is listed as a general supporting topic, we had several of our VECs were specific fish species, but we also looked at the fish community as a whole. We collected basic abundance and distribution information for all the species, and described the predicted changes as a group to

support the assessment of effects to VECs. For example, it's very important for many of our top level predators to understand what is happening to their forage species.

We looked at mercury and fish flesh as a supporting topic. It may affect fish health, but the primary interest is in terms of effects to the health of humans that consume the fish. And you will be hearing a great deal more about that and as part of the socio-economic assessment in a subsequent panel.

This is a slide showing the entire lower Nelson River extending from here, the Kelsey Generating Station, through Split Lake, Clark Lake, the reach of the Nelson River that will be directly affected by the Keeyask Generating Station in terms of changes to water levels and flows. This is Stephens Lake, as has been previously indicated, this is a reservoir that was formed when the Kettle Generating Station was constructed. And then we see there are two more generating stations currently in existence further down the river, the Long Spruce Generating Station here, and the Limestone Generating Station here.

Currently the remainder, approximately

120 kilometres of the river, are free flowing down to Hudson Bay. I should note, though, that this reach of the river is affected by operation of the Limestone Generating Station as water levels are regulated at this station.

The other important point that I want to make on this map, and it's often stressed by the First Nations, and you have also already heard about that, is that this is not a natural system, this is a highly regulated system. And so when we're thinking about it, we need to think about it in terms of the fact that it is what the environment is today, and how that environment has been altered by the existing hydroelectric development.

For example, if you are looking at a hydroelectric development in a natural system, you may be very interested in the loss of the spring frechette. In this system, because it's regulated, that spring frechette no longer occurs, except under flood years, it no longer occurs as it did in the state of nature. So that is one change that we didn't look at.

Focusing in then on my map, once again to orient you, this is the Kelsey Generating

Station at the top end, the Kettle Generating Station at the bottom end. This reached through Split Lake, Clark Lake, the Nelson River, and Stephens Lake is the area where most of the aquatic studies were conducted. And it is basically our study area.

The area that we looked at most intensively is this reach, the reach of the river between Long Rapids and Gull Rapids and the immediate part of the river downstream where the water levels and flows will be changed as a result of the Keeyask Generating Station.

We looked at Stephens Lake downstream, because Gull Rapids and this part of the river here does provide important habitat for some of the fish that live in Stephens Lake. And so there might be an effect, which to the physical environment or aquatic habitat is limited to here, but it could be experienced by fish that live throughout Stephens Lake.

In addition, we looked at Split Lake. And we looked at Split Lake for two reasons. First of all, it is possible at the start of our studies that fish moving from -- could move from the area directly affected by the Keeyask project

up into Split Lake. Also, both the Tataskweyak Cree Nation and the York Factory First Nation live on Split Lake, and they were very concerned about effects extending upstream from the Keeyask Generating Station and Keeyask project into the lake, which is very important to them.

Mr. Davies provided an overview of many of the studies that have already -- that were already available to us when we were starting the Environmental Impact Statement. Obviously, as a first step in your assessment, you looked to see what kind of information is already available. And this basically provides a list of the studies that we referenced in the aquatic environment part of the EIS.

There were studies that were done prior to and after Lake Winnipeg Regulation and the Churchill River Diversion. As Mr. Davies mentioned, they extended from the early 1970s to the 1980s. There is ongoing Provincial water quality station, a station close to the community of Split Lake, which is very useful for us in terms of assessing longer term trends in water quality. Because the station is immediately upstream of the Keeyask area, it is relevant to

our assessment of what is happening at Keeyask.

As Mr. Davies mentioned, there has been a large amount of information collected on mercury in fish. There was one technical study that was done on sturgeon by the Split Lake Resource Management Board in Gull Lake in 1995. The Split Lake Cree post project environmental review did provide us with an overview of effects both to Split Lake, and also to a lesser extent further downstream. And finally, the Tataskweyak environmental monitoring agency did some aquatic studies in our area of interest, in 1997 to 1998, but most of that work was focused on Split Lake.

Now, this information provides us with very good information on sort of what's been happening in the area in general. It also provides us with a very good record of what has happened in places affected by hydroelectric development close to our area of interest. But there was relatively limited technical information within our direct reach of interest from Clark Lake to Stephens Lake.

I should also mention, of course, that the traditional knowledge studies by the First Nations Partners provided information on the past

effects, both in our area of interest, as well as in other areas affected by hydroelectric development that were close to our -- for example, Stephens Lake.

Now, the environmental assessment studies have been going on for over a decade. Early work provided the basic information and the basis on which additional studies were done where required. So we began our work in 2001. And as you may note, if you have reviewed the EIS, most of the basic work was done from 2001 to 2004. And then this provided us with a very good basis for determining where do we need to do additional work? And by having such a long time period, we were able to basically develop a much more robust assessment.

For example, one of the places that we have been doing quite a lot of work in the recent years is on developing the lake sturgeon mitigation program. And one of the important parts of that program is stocking, which I will be discussing later, and we have been able to test various spawn collection methods for several years to better determine how such a program could be implemented.

We have also had ongoing data collection for some parameters, which required a more continuous record. For example, lake sturgeon population estimates have been conducted in alternating years in what we call the upper Split Lake area and the Keeyask reach since the early 2000s.

We did, in 2009, recognizing that there might be concerns about, you know, we did work in 2001 to '04 -- have conditions changed? We did some targeted sampling in 2009, for example, water quality, just to verify that conditions have not markedly changed. We have also, in 2011, initiated some pre-construction monitoring programs. And those are programs where you would require some data immediately prior to the construction period, and progressing into -- so that it can continue on into the construction period. For example, we have long-term tags, ten-year tags that were put into lake sturgeon, which I'll be discussing more later. And so we'll have individuals that have had the opportunity to move in existing environment, and then we can observe how their behaviour changes as the construction of Keeyask proceeds, if indeed the

project is built.

We used a wide variety of sampling methods, and they are described in detail in the aquatic environment supporting volume. Here on this slide you can see water quality sampling is being conducted, and this individual is using a meter to look at water quality, specifically oxygen conditions in the winter.

Gillnetting is a very common way of sampling the fish community. This benthograph is used to, basically you can lower it to the bottom and set it off and collect a sample of the muck on the bottom along with any small bugs that are living there.

And finally, this slide shows a walleye, and it's been anesthetized, and you can see here they are applying the anesthetic, and it's going to have an acoustic tag inserted into its internal body cavity. It's basically, it is a type of surgery, you open it up, you put in your tag and then you stitch it up and release it quite quickly. And this is a method that we have used successfully, actually, on well over a hundred fish.

Now, moving on to the existing

conditions effects assessment and mitigation. Looking first at the historic water quality, the First Nations have reported that water is murky and of poor quality post hydroelectric development. And there are reports that report that the first changes occurred after construction of the Kelsey Generating Station, and then they continued to see worsening conditions through the LWR and CRD, and also looking at the post Kettle Generating Station.

There was no technical data from water quality sampling in much of the area prior to 1970, so our ability to assess changes of those early hydroelectric developments is limited to major changes.

Basically, in Split Lake, the technical analysis shows that water is softer, because the Churchill River diversion, basically that water contains less dissolved substances so the water is basically softer. There's been no change in nitrogen. And following CRD, there was a temporary increase in phosphorous, which then decreased again. And we haven't seen any consistent conclusion in terms of the effects of, for example, LWR and CRD on water quality.

Most of the studies that were done involved the comparison of samples from the early 1970s, a couple of years, to samples collected through a portion of the 1980s, and some of the parameters like water clarity very considerably depending on what's happening in terms of flood and droughts and so on, so they are quite variable.

Looking at today's environment, the water clarity is relatively low. And that's because in much of Northern Manitoba, there are fine clays in the watershed. And these clays, when they are suspended, basically give the water this murky appearance that you can see here.

The nutrients, such as nitrogen and phosphorous, occur at moderate levels, the water is moderately nutrient rich. The phosphorous levels are what is called a meso-eutrophic to eutrophic. So basically the Federal Government has developed various standards, and if phosphorous levels at certain concentrations, they classify your water according to those levels.

The dissolved oxygen throughout the system is generally high. We do measure lower levels in some off current areas in winter, which

isn't surprising because there's more organic material in some of the off-current areas and this decomposes during the winter months.

Moving now on to the effects of the Keeyask project. The construction effects were assessed on the basis of models to estimate changes to water quality, and then compared to guidelines and existing conditions. Most of the effects will be addressed through management measures such as sediment control, or we also indicated here effluent control. For example, any sewage from the camp is collected, it's treated to meet appropriate standards prior to release.

Most of the effects will only be measurable near the construction site. And the exception to that will be there will be some periods when elevated concentrations of total suspended solids, which is typically abbreviated as TSS, extend farther downstream. And TSS is basically particulate matter in the water, and it's mud for those of you who are non technical. And this will occur during periods of intensive in-stream work. Obviously, when people are constructing or removing cofferdams, you are going to have some release of sediments to the water.

Based on the work that the physical environment team has done, we expect elevated levels to occur for one to three months in each of two years of intensive in-stream construction during the construction period.

Now, the concentrations will be most elevated close to the construction site, and then fairly rapidly increased downstream, such that downstream of the Kettle Generating Station, the increases will be very small, less than 5 milligrams per litre.

Looking at the operation effects, the assessment was based on a variety of techniques. As Mr. Davies mentioned, we used a variety of models as well as proxies to do our water quality assessment. Now, the models that were used include some that were used by the physical environment team, for example, to predict the concentrations of suspended sediments, as well as dissolved oxygen.

We also did what are called mass balance models. We estimated the amount of, for example, nutrients such as nitrogen and phosphorous that are in some of the plant materials that will be flooded, we estimated some

flux rates of those nutrients based on experimental work that's been done in a variety of systems, such as the experimental lakes area. And through those methods we were able to calculate how much would be released and what the concentration would be in the water column.

Proxies were a very important part of the water quality assessment. We have records of what happened in Stephens Lake following impoundment by the Kettle Generating Station. The Stephens Lake is quite a similar environment in terms of areas that will be flooded, or the types of land that will be flooded to the Keeyask project. And so that provides a very valuable guide. We also were able to use information from Southern Indian Lake and Notigi Lake on the Churchill River Diversion route, as well as other reservoirs, for example, in Quebec.

To determine what the potential effects will be to the aquatic environment, we compared the predicted changes in water quality to guidelines and also to existing conditions in terms of what kind of a percent change are we seeing?

I should note that the flooding of

land and erosion of peat and mineral shorelines are the most important causes of change to water quality.

This slide summarizes the operation effects. And you will be seeing this slide actually reappearing throughout my presentation, because for many of the effects to the aquatic environment, where you are is actually quite important in describing the effects.

So, first of all, I want to start off to reorient you again. This is Clark Lake, which is at the outlet of Split Lake, in the western area end of the reach that will be directly affected by the Keeyask project. And then we go, extend downstream to the location of the proposed Keeyask Generating Station. And then here we also have Stephens Lake, and at the bottom end we have the Kettle Generating Station.

Upstream in this area of the river we are not expecting to see any detectable changes to water quality. Basically, our main pathways of effect are erosion, which will not really be affected, or there will be minimal changes up here, and there also will be minimal flooding. The water level changes extend up to here, but the

river has quite steep banks with a large amount of bedrock, and so we really don't expect to see any changes in water quality extending downstream at Birthday Rapids, until you get to the area of present day Gull Lake, down here, which is shown in the darker blue, and you can see the flooded areas are shown in the pale blue on the edges.

The largest changes to water quality will happen actually in areas that today are land, in these flooded areas. We expect to see an increase in TSS nutrients and metals, and a decrease in clarity, that is how murky the water is. It will become murkier, if you will. And oxygen will also be decreased during specific times, for example, during the winter, and also during the summer if there's prolonged periods of very calm winds when there's not very much opportunity for oxygen to enter the water.

These effects will occur for the first 10 to 15 years. They will be greatest in the very first years right after impoundment, in the first couple when there's the most material available for decomposition, and also when processes such as peat re-surfacing and breakdown will be the greatest.

It's important to note that these areas are all part of the reservoir, but the main flow in the reservoir will continue down the existing river channel. And so these effects will be largely confined to the flooded area. And in the main stem of the river, that is the area that is currently river, we are not expecting the basically flooding to cause any detectable changes in the water quality and through this area.

The change that will occur in the long-term in the main stem is that the total suspended solids will decrease, not a great deal, but somewhat. And that's basically because you're building a dam here, the water will be slowed down, and the fine sediments that are currently in the water that are being carried into the system, some of those will settle down here. That means that the clarity will increase in this area, and also in the southern part of Stephens Lake right here, because of course the water is directly affected by what's coming in. By the time you get to the outlet of Stephens Lake, there will no longer be a detectable change because material that's settling here in the current environment, basically settles in this part of Stephens Lake.

So by the time you reach the outlet, the water quality will be the same as it is today.

Looking now at the cumulative effects to water quality. With respect to cumulative effects, as previously mentioned, CRD and LWR affected water quality in our entire reach that we are interested in. During construction, as I mentioned, most of the effects will happen here at the Keeyask Generating Station and be detectable immediately downstream. There will be some periods when the effects of the elevated total suspended solids will extend downstream past the Kettle Generating Station, and potentially all the way to the site of the Conawapa Generating Station, which is much further downstream.

Depending on the construction schedules and what happens in the future, there is a potential for there to be overlap between the Keeyask Generating Station construction and the Conawapa Generating Station construction. If this occurs, the TSS inputs from both projects will need to be managed jointly to avoid harmful effects to aquatic biota.

There are other developments that will occur during the construction period, such as

development of transmission lines for the project, and also there will be some work in Gillam as part of the Gillam redevelopment project. However, these developments are not expected to affect water quality in the area where Keeyask will affect water quality during construction, that is downstream through Stephens Lake.

During operation, as I discussed, we will expect to see effects to water quality here in the flooded area as well immediately downstream. And when we looked at this map as a whole, we didn't see any other future developments, developments that would overlap with basically the operation period of the Keeyask Generating Station that would affect water quality in these areas, and thus have the opportunity to, or potential to interact cumulatively with the effects of Keeyask.

I should also mention in looking at this slide, you'll see here that there is darker water through this main area. This area for Stephens Lake shows you what parts of Stephens Lake were basically flooded by their construction of the Kettle Generating Station. So this is the old river channel, which I'll be talking about in

some of my subsequent presentations. And the pale blue area of Stephens Lake were areas that were flooded by Kettle.

So in summary then, during the construction period for water quality, most effects are only measurable near the construction site. There will be small increases in total suspended solids that extend farther downstream for short periods. And there is that potential overlap with the construction of the Conawapa which would require management if both projects are being constructed concurrently. During operation, effects to water quality in the flooded area would last for about 10 to 15 years, and the permanent reduction in the TSS in the lower reservoir and the southern portion of Stephens Lake, that would be a permanent effect.

In conclusion, the effects to water quality in combination with the future projects that we discussed are not expected to have a notable adverse effect to the aquatic biota.

Moving on to aquatic habitat which is our supporting topic. Aquatic habitat in the existing environment is quite varied. At the upper end of the river reach, that will be

directly changed by the Keeyask project, it's basically a deep, quickly moving river channel. The first, there is a set of rapids up here at Long Rapids which extends for several kilometres and is actually upstream of most of the changes that will occur in water level as a result of Keeyask.

Then the first rapids that we reach are Birthday Rapids here. And as was discussed yesterday, Birthday Rapids will experience a water level increase such that this white water area wouldn't exist in the future.

Then we continue on down through the river channel until we reach present day Gull Lake right here. And Gull Lake is essentially a splitting and a widening of the river. There's actually detectable flow right through the lake and much of the bottom consists of the kinds of materials you can see here from the edge. It's sand, gravel and cobble. Or actually it's cobble and gravel in the main part and then there's an area of sand along the northern part of Caribou Island.

Gull Rapids is about three kilometres long of rapids. There's smoother areas but much

of the rapids is very very intense white water. It doesn't look that impressive from this aerial photo, but if you're just downstream of Gull Rapids in a boat and look at those very large standing waves, you'd recognize that these are very very strong and very powerful rapids.

And then at the bottom end of the area that will be directly affected by Keeyask, as I mentioned, is Stephens Lake. And once again, here you can see there's the flooded river channel as well as the flooded areas of the north arm of Stephens Lake.

The changes to aquatic habitat were predicted based on -- were basically on -- sorry. The effects to aquatic habitat were based on models and other methods to predict what would happen to the habitat. For example, we looked at Stephens Lake as a proxy. We developed some models to predict how will the substrate in the reservoir change. And we used Stephens Lake, which is a very useful model, to help us predict that.

At the upper end of the reach, the habitat will be essentially unchanged. At Birthday Rapids, the white water will be lost.

But all of this area will remain very much as river habitat.

When we get down to Gull Lake, Gull Lake itself will experience quite a large several metre increase in depth and a decrease in velocity such that it will be essentially zero. And these areas here where there's currently gravel or cobble bottom will become silt. And we will be expecting that all of this area over time will become covered in silt on the bottom. The flooded land initially will be obviously peat and flooded vegetation. Over time, it will evolve to productive aquatic habitat with basically silt settling over the peat materials. And aquatic plant beds that currently exist in the shallow parts of Gull Lake will be flooded out here and over time established in some of the areas' flooded habitat.

Gull Rapids will either be flooded out or a portion of the southern channel here will be dewatered. And finally you have Stephens Lake. And basically at Stephens Lake, the habitat is not being changed.

Looking at the things that we call lower trophic levels which are important as fish

food. The phytoplankton, or algae, we don't expect a large increase in the amount of phytoplankton because they are limited by light, the water clarity as well as how quickly the water is moving through the system. We do expect that there might be some blooms of phytoplankton in shallow flooded areas when the water becomes a little clearer over time, and possibly in the clearer water of the lower reservoir and Stephens Lake.

In terms of the aquatic plants, the existing plant beds in Gull Lake will die out and there will be new plant beds that will develop, but their development will be limited by both the bottom type and the water level fluctuations in the reservoir.

The benthic invertebrates, immediately after impoundment, they will begin to colonize those flooded areas which are currently land but it will be limited to species that are tolerant of poor environmental conditions in the first few years. And over time, based on work that we've done in other flooded environments, we expect to see the full range of aquatic biota that you typically see in shallow areas with an organic

substrate.

In the long term, of course, the total amount of benthic invertebrates is going to increase because there will basically be a doubling of the available aquatic habitat.

Moving on to the fish community. In terms of historic effects, the Cree Nations report that Hydro development has caused changes in the species abundance and distribution and the fish are of poor quality. They basically say these fish are -- all of the fish that come from waters affected by hydroelectric development are not good to eat.

With respect to the technical studies, as I mentioned, it's difficult to make exact comparisons because of changes in methods over time. You know, there's differences, for example, in the kinds of meshes in the gill nets that are set, so we can't make direct comparisons. However we can observe that the species composition and abundance have generally remained similar. Though there's some evidence that there's been a slight change in the relative abundance of some species.

One of the most marked changes that we have observed in the fish community actually began

in the mid 1990s with the arrival of rainbow smelt which is an invasive species. And that has become one of the dominant species in the forage fish community and one of the most important species in the diet of many of our predatory fish.

Today, during our technical studies, we have collected a total of 37 species, Northern Pike, Walleye And White Sucker were the most common large bodied species. And the most common small bodied species, that is those forage species, are shiners such as spot-tailed shiners, Trout-perch and of course Rainbow Smelt.

Now this is a very busy figure. And the purpose of it is to show you how does basically our area of particular interest, that is Split Lake, the Keeyask area and Gull Lake and Stephens Lake, fit into the larger picture of lakes in the surrounding areas of Manitoba? And this slide shows what is called Catch Per Unit Effort, or CPUE, which is the number of fish that you can capture in a standard length of gill net over a specific length of time.

So you can see here that for Stephens Lake to Split Lake, our CPUEs range from 23 up to 35. We can see that that falls within the range

of natural lakes that we observed. For example, War Lake is one of the lowest lakes at 21 while Wasakaiowaka is one of the highest lakes at over 104. But we can see here that there is quite a range in the CPUEs amongst the lakes and that our areas of interest fall within sort of the mid to lower part of that range.

This map compares two areas that are of particular interest. Stephens Lake, as I mentioned, is used as a proxy environment for what the Keeyask reservoir could be like in the future. So here I'm comparing Stephens Lake and the Catch Per Unit Efforts, three key species, to Gull Lake.

We can see here that the river sections of the environment that the CPUE is somewhat lower. For example, looking at Walleye, the CPUE in the riverine sections is around 3. When we move into Gull Lake in this area here, the walleye are more abundant, as you would expect, around 6. And in Stephens Lake, we can see that there's quite a range. In the northern flooded part of the lake, the CPUE is actually the high rest, almost 12 for walleye. While in the southern part where the main river flows, they are lower, and roughly comparable to what you see in

the river, ranging from 1 to 3.

Now, leaving the existing environment and moving on to our assessment of construction effects. Many of the construction effects are addressed through management measures such as following blasting guidelines. The Department of Fisheries and Oceans have specific guidelines that they set out for the size of charts and so on. The effects to water quality, as I mentioned, are also being addressed through a variety of management measures to avoid adverse effects to fish.

As you can imagine, during construction, as you heard during the project description, they will be building cofferdams. And as those cofferdams are dewatered, there is a potential for fish to be trapped within them and stranded. And so you conduct what's called a fish salvage. During construction, we will also see disturbance and habitat loss at the construction site in Gull Rapids which will cause a number of years of disruption to spawning habitat.

The net effect of all of these changes during the construction, we expect that there will be potentially week year classes of Walleye and

Lake Whitefish in Stephens Lake due to the reduced spawning habitat at Gull Rapids.

In terms of during the operation, we looked -- our assessment was based on changes to key habitat. For example, we asked what is happening to spawning habitat. We developed a habitat-based model where we looked at both what kinds of aquatic habitat are available in the existing post project environments, and how are fish using those specific habitat types today so that we basically could predict what would be happening in the reservoir in post-project environment. We also used proxies, such as explained to you already, Stephens Lake.

Mitigation was based on providing habitat for all life history functions, that is all things that a fish needs to successfully complete its lifecycle. And that includes things like laying eggs, rearing of young fish, feeding and overwintering. And we were targeting that both in the reservoir and in Stephens Lake.

The plans for specific compensation measures were described in the aquatic environment supporting volume and also are described in the draft Fish Habitat Compensation Plan.

The Fish Habitat Compensation Plan will be required by the Fisheries and Oceans Canada, or DFO, to issue an authorization under the Fisheries Act for this project.

Now this slide summarizes the operation effects to the fish community. First of all, as I mentioned, the river environment up here will not experience large changes, though there will be an increase in water levels through Birthday Rapids. The spawning habitat in the main stem will remain suitable.

Moving down to the flooded area, looking first of all at what's happening in Gull Lake. There's going to be, because the water will become deeper and velocity will become lower, there will be an increase in the foraging and overwintering habitat for Walleye, Lake Whitefish and Northern Pike. That being said, there will also be a loss of existing spawning habitat for Walleye and Whitefish because these species require rocky or cobble areas. And as I mentioned, there will be silt settling on the bottom of the lake. Also Pike will lose their existing littoral or near shore habitat.

Over time, this flooded land will

become suitable for Northern Pike, Lake Whitefish and Walleye. And that will basically be as the initial years pass and dissolved oxygen levels improve and aquatic plants become re-established.

Moving downstream. First of all, the generating station will both block and alter movements of fish. And fish that are moving downstream or attempting to move downstream past the generating station would potentially be subject to turbine mortality. As well, the Gull Rapids itself provide habitat for fish living in Stephens Lake. And that spawning habitat for both Walleye and Whitefish will be lost.

So as I mentioned, when we were developing our mitigation for this project, we wanted to create any habitat that would be missing. And spawning habitat is one of the areas that I flagged for you. So Walleye and Lake Whitefish do have other spawning habitat available to them in Stephens Lake. Also at the latter part of my presentation, I will describe for you a spawning shoal that will be developed for lake sturgeon in the tailrace of the generating station or downstream of the tailrace and that will also be used by Walleye.

In addition, Lake Whitefish will have a spawning shoal developed for them somewhere in the area of Stephens Lake. And that's because Lake Whitefish lay their eggs in fall and they have to remain on the bottom all through the winter. And we're not sure whether conditions on the spawning habitat developed for lake sturgeon here in the part close to the generating station would be suitable throughout the winter.

I also mentioned that Lake Whitefish and Walleye would lose the existing spawning habitat in the Gull Lake area. And so another part of the mitigation plan is to create spawning habitat for Lake Whitefish and Walleye close to locations where existing habitat will be lost.

So this map basically shows you some places that have been identified where shallow rocky reefs could be developed.

The generating station will also alter fish movements. The movements of adults of all species have been documented through the generating station. But they are not common. It's very unusual to see.

The larval fish drift over the rapids and that is because after egg hatch, all of these

species have a larval phase and these drifting larvae have been caught downstream of the rapids.

Based on our movement data, the post project habitat and what we have observed in other reservoirs, the partnership has concluded that fish passage is not required at the generating station to maintain the fish populations. In terms of downstream movements, the turbines have been designed to reduce effects to fish. However, fish passage is still an ongoing topic of discussion, particularly with the Department of Fisheries and Oceans. And I'll be returning to it at the end of this presentation.

So looking then at the net effect for Walleye and Lake Whitefish, during construction, we expect that there may be some week year classes in Stephens Lake due to the reduction in the total amount of spawning habitat available due to the loss at Gull Rapids. And that will be prior to having the compensation habitat available.

During operation, we expect a long-term increase in the reservoir due to the greater amount of habitat. And we don't expect any change in Stephens Lake.

Pike are somewhat different. They

don't use Gull Rapids so we're not expecting a negative effect during construction. However, during operation, we do expect an initial decline in the reservoir due to the loss of those aquatic plants in the near shore areas. But that will recover when the plants re-establish in 10 to 15 years. And we don't expect any change in Stephens Lake.

Now finally, looking at the cumulative effects. I have described for you changes to the -- effects to the Keeyask project occurring both in the reservoir as well as for a short period in Stephens Lake. So these areas, as was previously mentioned, have been affected by past hydroelectric development and obviously Stephens Lake itself was created by construction of the Kettle Generating Station.

In terms of looking towards the future developments, we don't see an overlap of the effects, for example, of Conawapa with this part of the fish community. So we didn't identify any future developments that had the potential to overlap with the effects of the Keeyask project.

So in conclusion then, no adverse effects outside of the Keeyask reservoir and

Stephens Lake are predicted. For Whitefish and Walleye, there will be negative effects during construction. For Northern Pike, we expect negative effects during the first years of operation until the abundance can recover.

The long-term effects are predicted to be either neutral or slightly positive. And that reflects the fact that the reservoir will, overtime, evolve to become a productive environment for these fish species just as we have seen in Stephens Lake. We didn't identify any future developments that have the potential to overlap with the adverse effects of the Keeyask project.

So in conclusion, we have no long-term adverse effects to Walleye, Lake Whitefish and Northern Pike that have been predicted.

My final part of my presentation involves mercury in fish. This is a conceptual diagram, similar to the one that I showed you at the beginning of my presentation. It describes the mercury cycle and relative mercury concentrations as are illustrated by these little red dots. What happens is that mercury, in its elemental form, for example here, is combined with

a carbon or what's called a metal group by bacteria that are basically decomposing organic carbon as happens after flooding. The mercury then, which has been attached to this metal group, can enter the food chain. And, first of all it can be taken up, for example, by algae here where it's just in very low concentrations. Then when it's consumed by bugs, the concentration increases. And that is because the mercury enters into the flesh of -- or the tissues of the different organisms and there it accumulates. So then when this bug is eaten by the fish, which eats many bugs, you can see that the level of mercury increases once again. Such that by the time you become fish eating fish, the mercury levels can be quite high. And it can either be transferred, for example, to humans or to fish-eating birds or species such as otter that also eats mercury.

On this diagram then, you can see that the mercury concentrations increase through the food chain so that species like Lake Whitefish have lower mercury concentrations and fish eating fish such as Walleye and Pike have higher mercury concentrations.

This is a graph that shows you -- this slide shows how mercury concentrations in both Stephens Lake and Gull Lake have changed over time. You may recall that Stephens Lake was impounded in the early 1970s, and we don't have mercury data from that point. But we do know that again mercury was first sampled in the early 1980s on this graph, the red triangles are Walleye and the blue circles are Pike at Stephens Lake. You can see both these species had very elevated levels, as you would expect following impoundment, and they have declined over time such that today, in the last number of years, they vary a little bit. But they basically have reached a long-term stable level.

In comparison, you can see down here, the green Whitefish from Stephens Lake. There's no evidence that they were ever elevated though they might have been very close to impoundment. And you can see that just their natural base concentration is considerably lower than the predatory fish species that is Pike and Walleye. Also shown here very faintly, you can see a very faint line here with the open symbols is where Gull Lake is today. And you can see that Gull

Lake levels for Pike and Walleye are essentially the same as they are in Stephens. And also, here are the open symbols for Lake Whitefish in Gull Lake. And they are essentially the same as they are in Stephens.

The effects to mercury were predicted from models that were developed by looking at the reservoir in, various reservoirs in Northern Manitoba. As Mr. Davies mentioned, there were a lot of mercury studies that were done at the time of both CRD and LWR. We also extrapolated from the Stephens Lake increases since the terrain that will be flooded in the Keeyask reservoir is much more similar to what was flooded in Stephens Lake than in some of the other reservoirs in Manitoba. And the key point is that it contains a large amount of peat which has a lot of organic substances and can lead to higher mercury concentrations.

The model predicted concentrations, depending on which model was used, the concentrations for Northern Pike and Walleye increased between .8 and 1.5 parts per million in the reservoir. Based on the strengths and weaknesses of these models and professional

judgment, the mercury concentrations are predicted to reach about one part per million. And the reason for that is because the Keeyask reservoir is relatively small and will have a high amount of water flowing through it. And so you don't expect mercury to increase as much as it would in a system with basically less through-flow of water. The maximum concentrations are expected four to seven years after flooding and it will take about 20 to 30 years to return to long-term stable levels as we saw in Stephens Lake.

The mercury concentration in Whitefish will increase only slightly to about .2 parts per million.

Now, looking at the effects of mercury to fish, laboratory studies have demonstrated that there are some effects. So if you feed fish food with elevated levels of mercury, you can detect some effects to their behaviour and reproduction in a laboratory setting. However, when you look at what's happening to a population in the reservoir, we don't have any clear evidence that concentrations of .5 to 1 parts per million, which is what we're predicting, will have negative effects on populations. And also work from other

areas like Quebec, where the fish mercury concentrations were much more than double at levels of 3 to 4 parts per million. Even there they did not observe any population level effects.

Now the effects to resource users that is the human consumers of fish, will be addressed by offsetting programs to provide alternate sources of fish as well as communication products with respect to fish mercury levels and recommended consumption levels. And that is something that you will hear about in detail from the socio-economic resource use and heritage resources panel.

So we have now reached a break in my presentation. I'm not sure of the time but I don't know if this would now be a convenient time for a break. Or Shelley I believe has about a 20 minute presentation.

THE CHAIRMAN: Thank you, Ms. Schneider-Vieira. I think this would be a perfect time for a break. It's just a couple minutes to 11:00. So thank you for that presentation and we'll come back at 10 after 11:00.

(Proceedings recessed at 10:56 a.m. and reconvened at 11:12 a.m.)

THE CHAIRMAN: Thank you.

Ms. Matkowski, you may proceed.

MS. MATKOWSKI: Thank you very much, good morning ladies and gentlemen. And thank you for the opportunity this morning to speak to you about lake sturgeon and stewardship in Manitoba. As Friederike mentioned, my name is Shelley Matkowski, and I work for Manitoba Hydro's Environmental Licensing and Protection Department.

My presentation today will cover lake sturgeon distribution and biology, just a little on it, the history of the impacts on lake sturgeon in North America, the recognition of the need for recovery, and primarily the stewardship tools and actions that are being used in Manitoba towards sturgeon recovery.

Historically, lake sturgeon were abundant in many large rivers and lakes in North America. This map illustrates lake sturgeon distribution in North America.

Unfortunately, unique life history characteristics make lake sturgeon particularly susceptible to overharvest and slow to recover once populations have been depleted. One of these characteristics is late maturation. Lake sturgeon

may not spawn until they are 15, 20, or even 30 years old, depending on whether they are male or female and what water body they are found in. Late maturity, combined with large body size, allows many years of opportunity for them to be harvested before they can reproduce even once to replenish their populations. As well, they don't spawn every year like most freshwater fish. Instead, individual lake sturgeon may spawn only every 3 to 7 years. Again, this results in low population replenishment and plenty of opportunity for harvest between spawning events.

So, populations across North America were quickly depleted by commercial overharvest in the 1800s to 1900s, when European markets looked to North America as they could no longer be met with European sturgeon species. In Manitoba commercial fishing depleted most lake sturgeon populations from south to north as rail transportation developed. Accessible populations on the Nelson River were some of the last to be depleted in the early to mid 1900s. As stocks were depleted, the commercial fisheries were closed and reopened a number of times before final closure. The last commercial fishery on the

Nelson River closed in 1992. The last commercial fishery in Manitoba on the Fox Bigstone River system closed in 1999.

Following overharvest across Canada, industrial development, urbanization, and agriculture further contributed to population declines or hindered recovery of populations, primarily through habitat losses and changes. Multiple impacts often meant that cause and effect relationships of sturgeon populations were not immediately obvious. A number of factors may be limiting recovery of individual populations. For example, populations in tributaries to the Great Lakes were first overharvested in the 1800s, and then through the 1900s habitat was degraded, lost and altered through pollution, siltation, fragmentation, flow manipulation and invasive species.

On the Nelson River, hydroelectric development began in 1957, just as depletion from commercial fishing was becoming severe and commercial fisheries were being closed.

Because lake sturgeon had been depleted across Canada, the Committee on the Status of Endangered Wildlife in Canada, or

COSEWIC, assessed the status of lake sturgeon populations in 2006. In most rivers and lakes in Manitoba, including the Nelson River, COSEWIC determined that lake sturgeon met their criteria for classification as endangered, one of which is a population decline of more than 50 per cent in the last three generations, which for lake sturgeon is over 100 years and encompasses the commercial fishing overharvest.

Once COSEWIC has assessed a species as endangered, it must be considered for listing under the Federal Species at Risk Act. That review is currently underway.

Long before the COSEWIC assessment, in Manitoba the Provincial fisheries managers, First Nations and stakeholders recognized the need for recovery of lake sturgeon populations. For over two decades they have been working collaboratively to protect and enhance lake sturgeon populations.

One of the earliest measures taken was the drafting and implementation of the Manitoba Lake Sturgeon Management Strategy by the Manitoba Department of Natural resources in 1992. The complete closure of the commercial fisheries that I have already outlined was an action taken from

this strategy. It continues to be implemented by Manitoba Conservation and Water Stewardship Department, and has been updated a number of times, most recently in 2012.

Another stewardship measure taken early in the 1990s was development of cooperative sturgeon management groups consisting of First Nations, local communities, regulators and stakeholders. One of these is the Nelson River Sturgeon Board which was established in 1992, and has focused its efforts on the upper Nelson River, from Lake Winnipeg downstream to the Kelsey Generating Station. The board conducts population monitoring, habitat assessments, educational programs, stocking, and voluntary harvest reduction. Since there is no longer any commercial harvest of lake sturgeon allowed in Manitoba, and since the sport fishing limit is zero, the only allowable harvest is by First Nations people for subsistence and cultural use. The Nelson River Sturgeon Board has recognized that in some areas where sturgeon populations are severely depleted, any harvest at all can limit recovery, and so they promote voluntarily harvest reduction.

Their efforts have been rewarded, as recent monitoring confirms increasing numbers of young sturgeon in the upper Nelson River, both as a result of stocking where too few spawners were left for natural recovery, and elsewhere as a result of natural reproduction, where harvest reduction has allowed remaining spawners to successfully reproduce.

More recently the lower Nelson River Sturgeon Stewardship Committee was established by a legally binding agreement. It is a 20-year commitment to work cooperatively to conserve and enhance lake sturgeon populations from Kelsey Generating Station down to Hudson Bay. The committee has membership from Tataskweyak Cree Nation, War Lake First Nation, Fox Lake Cree Nation, York Factory First Nation, Shamattawa First Nation, Manitoba Hydro, and the Keeyask Hydropower Limited Partnership. The Manitoba Conservation and Water Stewardship Department also participates as a non voting member.

In its initial year, the committee has focused on assembling Aboriginal traditional knowledge and scientific information on populations and habitat. They are now discussing

recovery actions and projects to be undertaken.

This map illustrates the area of primary focus for the lower Nelson River stewardship committee, it is the Nelson River from the Kelsey Generating Station here, downstream to Hudson Bay, and it includes the Keeyask site at Gull Rapids.

As a stakeholder, Manitoba Hydro recognized the need for lake sturgeon stewardship as long ago as 1987, and has since been working to fill information gaps on populations, habitat, ecology, biology, and impacts of hydroelectric development, as well as undertaking public education programs. We have worked collaboratively with regulators, including Manitoba Conservation and Water Stewardship, and Fisheries and Oceans Canada, as well as with sturgeon management groups, First Nations, and academic institutions.

In 2007, this work was consolidated into the Manitoba Hydro lake sturgeon stewardship and enhancement program, with an objective to maintain and enhance lake sturgeon populations in areas affected by Manitoba Hydro's facilities and operations, and with a 30-year plan based on an

adaptive management approach. The program continues to expand, including development and implementation of mitigation and enhancement measures such as the creation of spawning shoals.

Grand Rapids fish hatchery is another tool that has played a significant role in sturgeon stewardship in Manitoba through fish rearing research and education. Originally owned and operated by the Province of Manitoba, Grand Rapids fish hatchery has reared and stocked lake sturgeon since 1994. For 20 years the hatchery has worked collaboratively with regulators, sturgeon groups, academic institutions, and other hatcheries in Canada and the U.S., to continually improve egg collection, fish rearing, bio-security and genetic diversity. Over the past decade, Grand Rapids hatchery has produced over an average of 10,000 fingering sturgeon per year for education, research and stocking.

Manitoba Hydro has owned Grand Rapids hatchery since 2007, and operated it just over a year now. As part of assuming full operations, we have increased staffing and introduced standard operating procedures for even greater security of fish production. We are currently undertaking a

complete review of fish production procedures and infrastructure by HDR Corporation of Illinois, who are the foremost in design and operation of lake sturgeon hatcheries in North America.

Lake sturgeon stocking has been used as a stewardship tool for 20 years in Manitoba. The Assiniboine River in Brandon was first stocked by Manitoba Natural Resources in the mid 1990s, as a trial to determine whether lake sturgeon stocking would actually work in Manitoba. The Assiniboine River was chosen because the natural population of lake sturgeon had been extirpated or essentially destroyed decades before. Anglers now frequently capture sturgeon over one metre long in the Assiniboine River and the sturgeon have spread as far upstream as the Qu'Appelle River in Saskatchewan. The stock fish are now reaching reproductive age, so a study has been initiated to determine whether they may have already begun to reproduce naturally in the Assiniboine River.

On the Winnipeg River, stocking was conducted in reservoirs of selected generating stations as a convenient site to facilitate research on survival, growth and movements of stocked lake sturgeon. The University of

Manitoba, the Canadian Rivers Institute, the Deep Rivers Science Academy, and the University of New Brunswick all participated in this research.

Since we now know that the natural populations of lake sturgeon in the Winnipeg River in Manitoba are all reproducing, and some populations between generating stations are actually abundant, stocking is not necessary for recovery in the Winnipeg River.

The Saskatchewan River has been stocked by the Saskatchewan River Sturgeon Management Board since the late 1990s at The Pas and Cumberland House to supplement natural reproduction. Over the past decade, board members have reported and continue to report increasing captures of small sturgeon in the Saskatchewan River.

And as mentioned earlier, the upper Nelson River has been stocked by the Nelson River Sturgeon Board to recover depleted populations. Recent monitoring has found a variety of sizes and ages of young sturgeon, many with tags identifying when and where they were stocked.

I hope that I have given you an overview of the variety of tools that are being

used for lake sturgeon stewardship in Manitoba. Through the stewardship actions of many people, some lake sturgeon populations in Manitoba have begun to recover.

I would like to leave you with the following quotes from Manitoba Conservation and Water Stewardship's 2012 lake sturgeon management strategy.

"The outlook for lake sturgeon has improved significantly since the first Manitoba sturgeon strategy in 1992. The reaches that were the focus of the 1997 strategy on the Winnipeg, Saskatchewan and Nelson Rivers, all of which were described as depleted or declining, are now showing signs of improvement."

Thank you. And now I believe that Friederike will tell you about the sturgeon specifically in the Keeyask area.

MS. SCHNEIDER-VIEIRA: Thank you very much.

As Shelley has just provided you with an overview of the best leading situation in Manitoba, and she has also actually provided some

insights into what will be an important part of my talk, which is what kinds of things work, what kinds of measures work to help re-establish sturgeon where they are in -- where their populations are very low.

So, first of all, as Shelley mentioned, in looking at the historic commercial fishery on the Nelson River, that commercial fishery underwent, well, it began in the early 1900s, and the sturgeon were very, very quickly depleted, such that the first closure actually happened already in 1911. And there were a total of four closures between 1911 and 1969 due to overharvesting.

It was reopened for the last time during the period 1970 to 1987. At that point they had started getting more detailed records, so we have some idea of how many sturgeon might have been harvested from the Keeyask area. It is anywhere from 250 to 500 fish that we think may have been harvested in that 18-year period from in the Kelsey to the Kettle area. And the Nelson River fishery was finally closed in 1992, in the Nelson River. We know from local resource uses that sturgeon were still relatively abundant in

Stephens Lake until at least the 1980s.

Moving on to the historic impacts of hydroelectric development. As I had mentioned in the first part of my presentation, the lower Nelson River was affected by the Kelsey, Kettle, Long Spruce and Limestone generating stations, as well as both CRD and LWR.

Now, members of the First Nations that have been working on this project report that hydroelectric development caused a decline in sturgeon and fewer remained after each successive dam.

We do know, though, that reproducing sturgeon populations remain in the entire lower Nelson River with the possible exception of the Long Spruce and Limestone forebays, where the number of sturgeon are very, very low, and we haven't documented any successful spawning.

Now, when we were working on sturgeon, as I mentioned in the first part of my presentation, it was a very key species, and a great deal of effort has been expended on studying the species. So there were several different kinds of studies. There were studies looking at the abundance, and unlike the other fish species

we actually developed population estimates through a mark and re-capture technique. The way this works is that, for example, in the Gull Lake area, we go out in spring close to where we know that they are gathering to spawn, and capture as many adults as you can. You put a mark, you tag them all, and then you repeat your sampling program a few weeks later. You see how many you recapture, and that allows you to estimate how many sturgeon are in that area.

Now, sturgeon are actually difficult species to estimate their abundance because they actually only spawn, as Shelley mentioned, females might only spawn every five years. So the program that we used also allowed us to estimate, as we continued collecting more and more data, estimate how many sturgeon that we are only seeing every few years, that aren't coming back every year to spawn, because we know that they don't. However, you will see there is a fair bit of uncertainty in the population estimates.

We looked at habitat use, because habitat is what is being affected by hydroelectric development. We used gill netting, and also what are called radio and acoustic tags. This is a

very important technique that we use, where I had showed you the slide earlier where someone was placing a transmitter inside the body cavity of a fish. Then you place receivers that can detect the signal, for example, the acoustic signal, or little beep that's emitted by this transmitter, and the receivers are placed in different parts of the river, and then you can find out whether or not the sturgeon are passing close to receivers, if they are hanging out in the vicinity and so on. So you get very detailed information on both where they are moving and what kinds of habitat they are using.

Finally, for the habitat component of our studies, we developed models which are called habitat suitability index models. We developed them for spawning, for young sturgeon, sub adult sturgeon, and adult sturgeon, just to cover all parts of their life history. These indices basically used information from both our work as well as work elsewhere, to identify what kind of velocity, substrate, and water depth sturgeon use to complete their various life histories functions, so that we could better predict what will happen to them in the new aquatic environment

being created by the Keeyask reservoir.

We also, as I mentioned, did movement studies using floy tags, which are little almost like spaghetti tags that you may have, if you are a recreational fisher, you may have also seen them on walleye or trout, as well as the radio and acoustic tags.

We also did a fairly extensive genetic study, which is actually, analysis for that work is actually ongoing. And for that, as Stu mentioned in his introductory program, we actually employed some geneticists out of Laval University, who are actually, basically they are the fish geneticists across North America. And as we discussed earlier, all of this work has been ongoing since 2001.

Now, when we were studying sturgeon in our area from the Kelsey Generating Station, all the way down to the Kettle Generating Station, we discovered very quickly from our movement data that sturgeon seem to be primarily dividing their use of this area into three areas. First of all, there is a group of sturgeon that occupy what we call upper Split Lake, so we can see them moving up into the Burntwood River and actually spawning

here at First Rapids on the Burntwood River. We can also capture the sturgeon in the lower parts of the Nelson River, or the Nelson River below the Kelsey Generating Station all the way through this reach. And we have also found some sturgeon going up into the Grass River here. So we call this the upper Split Lake area. And these fish are known to spawn at the First Rapids on the Burntwood. And we suspect, having caught very few, because there are very few sturgeon in this area, but we have caught fish that have eggs in them, or one female, I should say, that had eggs that looked like she was ready to spawn in the Grass River, as well as a couple downstream of the Kelsey Generating Station.

I should point out that all of these areas were actually historic sturgeon spawning areas as well.

Moving down to the area that will be altered by the Keeyask Generating Station, we found that there are a group of sturgeon that lives in Gull Lake, as well as in the river reach going up to Birthday Rapids, and these sturgeon can spawn at either Long Rapids or Birthday Rapids. The orange colour indicates that spawning

has been known to occur in the general area, but it is not as though they are using this entire reach to spawn.

Similarly, we have found sturgeon in Stephens Lake, though very, very few, and most of them live sort of in this area downstream of Gull Rapids, as well as the upper portion of the flooded river channel that I showed you on some of my other maps. We haven't found any sturgeon up here in the north arm at all. And occasionally they move further downstream towards Kettle, but on the whole they are occupying this part of the lake. And these we know would be spawning somewhere in Gull Rapids.

As I mentioned, we used a mark recapture method to estimate the number of mature or adult sturgeon. We have been collecting these estimates in alternating years in the Birthday to Gull Rapids reach and in the upper Split Lake area. Our most recent population estimates from Birthday to Gull is 643 fish with a 95 per cent confidence limit of 384 to 1,178. This is quite wide, because as I mentioned, the sturgeon don't come back every year to spawn, and so you have uncertainty about what those fish are doing that

you -- that basically you don't see each year.

In the upper Split Lake area they are slightly fewer. There are right now 585, once again with a fairly wide confidence interval.

And too few fish were captured in Stephens Lake for an estimate. Just to give you an idea, since we began work in 2001, we have caught less than 100 adult fish in Stephens Lake. So there the numbers are very, very low.

Now, I just wanted to compare to the reach below the Limestone Generating Station, which is that, just over 100 kilometres where there the population estimate is anywhere from 3,000 to 8,000 sturgeon. By way of comparison, the area from Stephens Lake all the way through upper Split Lake is basically also a single area. And if you can estimate, that has a couple of hundred river kilometres, if you sort of estimate the total distances available through both the lakes and river segments, and it has around 1,000 sturgeon in comparison.

Now, based on our estimated recruitment, the upper Split Lake area appears to be stable, while the Gull Lake area may be declining, and Stephens Lake is basically, there

are too few sturgeon there to be viable population.

The populations everywhere are very vulnerable. We see a very small proportion of older, mature fish. We see a very limited number of young year classes. That means that when you go out looking for let's say one year old fish, you are finding that -- actually the ten years that we have worked in the Gull Lake area, we have only seen one year class from 2008 be successful. So it is a very, very erratic recruitment.

And finally there is continued domestic harvest in this reach. And the domestic harvest quantities that we know of are very low, we are talking about, you know, 10, 20, 30 fish. But when your populations are in the low hundreds, that small amount of harvest can also significantly reduce the amount of reproducing adults.

We did work on population genetics, and there were two basic reasons; one is we wanted to gain a better understanding in the entire area, how do these various sturgeon groups relate to each other, how much interchange is there among the groups? And I should mention to you that

these are genetic samples from adult fish, and this generic structure that we have seen here would basically pre-date hydroelectric development. So it would reflect natural divisions, a natural -- basically where the fish were even prior to any kind of construction of dams.

So we see that there are four groups in this area. The sturgeon that were collected by the Nelson River Sturgeon Board upstream of the Kelsey Generating Station, which showed at the Landing River area, is genetically distinct from the sturgeon that we see downstream in the Grass River and upper Split Lake area. Those, interestingly, are genetically distinct from the sturgeon that we caught in the Gull Rapids area -- sorry, in the Gull to Birthday Rapids reach. So even though there is actually no barrier between these groups, apart from the small rapids at Long Rapids and Birthday Rapids, they are still actually not moving amongst the groups enough to create genetically the same population.

Then moving downstream into the area downstream of the Limestone Generating Station, we looked at fish along the main stem from the Weir

River and Angling River, and moving up over into the Hayes. And these are genetically basically all the same.

Now, I should mention that this genetic analysis was done on what are called micro satellite markers, and that currently a study is being done using much more refined technique. So we expect when we look more closely at the genetic structure that we may actually see further divisions amongst some of these groups.

In addition, this more refined genetic analysis will help us determine how much interchange is there between, for example, the Landing River and Burntwood River, or upper Split Lake. Because that will help us make decisions about whether when we are stocking, do we want to introduce a little bit of spawn from the Landing River? What would make the most sense?

Now, moving on to the construction effects. As I talked about for other fish species, many of those effects or potential effects are addressed through management. For example, the dewatering during cofferdam construction will also be addressed through basically fish salvage operation, but it will also

be mitigated by the timing of in-stream construction.

The construction group has worked very hard to avoid certain critical periods for sturgeon, such as the spring spawning period, so that you aren't having many sturgeon, or some sturgeon having entered Gull Rapids to spawn, and then you are surrounding them with a cofferdam, and basically potentially adversely affecting, or stranding them and having to do a fish salvage.

In addition, during the construction period, there will obviously be disturbance of habitat loss. During the construction period we expect that sturgeon may not spawn, even in the parts of Gull Rapids that are still available. Just the noise, the commotion and so on, will be enough to keep them away.

I should mention, though, that during the past at least half dozen years, we actually haven't seen any evidence of spawning at Gull Rapids. So it might almost be a nil effect, just because there are so few sturgeon.

Also, we have seen in other systems that as water levels begin to change as people start to build dams and the water levels start to

rise, that may trigger immigration of adult sturgeon. For example, the reservoir in Quebec, when it was impounded, they found quite a large number of their tagged sturgeon actually move downstream and out of the system. And we have seen some evidence of that as well after the Limestone Generating Station was constructed.

Moving on to the operation effects, as with other parts of our study, we did take several different approaches. We looked at changes in key habitats. We looked at experience in other reservoirs, and for that we used both technical studies, as well as Aboriginal traditional knowledge, which provided us with information about reservoirs for which we had no technical information. And we also developed, as I said, the habitat suitability index models and we looked at the results of those. We compared how suitable does the habitat look like in existing environment to how suitable is it in the post project environment? We also considered all of the different life history stages. We looked at spawning and hatch, and immediately after hatch the larval fish drift down river.

We looked at what happens to the

young-of-the-year. Those are the fish that have drifted down the river and they settle somewhere in the environment. And there is a lot of evidence now that this might be the most critical history stage for lake sturgeon, because they need to drift from a spawning area and arrive in an environment where they can successfully and very quickly find food.

We also looked at juveniles and some adults, and that's basically all fish between the ages of one up to about 18. We use a 800, I was going to say about 850 millimetres as our cut-off for mature fish because that's the youngest mature, smallest mature fish we found. And finally we looked at adults.

When we were developing mitigation, the key point to the mitigation was to provide habitat to support all life history requirements, both upstream and downstream of the generating station. And the way we did that, we took several different approaches, but one of the things we did was review the characteristics of reservoirs that support sturgeon. We know from ATK and from observations on the lower Nelson that there are many reservoirs there which don't support

sturgeon. But we also know there are places, for example, along the Winnipeg River and the Nelson River upstream of Kelsey where there were sturgeon populations a long time after hydroelectric development. So what is it about those reservoirs that allows them to basically keep sturgeon when they have disappeared elsewhere?

The other thing which we did, because we wished to obviously benefit from the successes of others, was we did a fairly extensive review and also talked to several experts about what are successful approaches to population recovery in other areas. Shelley just mentioned in her presentation that there are even some good examples from here in Manitoba.

So, looking, first of all, at the recovery and mitigation measures, looked elsewhere. One of the, perhaps I would say the most common method for recovering sturgeon is stocking, and closely related to that is translocation. So stocking is, as Shelley described, it is when you collect spawn from sturgeon, you raise, you hatch the eggs in a hatchery and you raise them up to a certain life stage, and then you let them go. Translocation is

when you actually capture sturgeon in the environment and then physically move them to somewhere else. These strategies work very well where there is habitat available. Lake sturgeon respond very, very well to stocking. There is a slough of examples of successful stocking programs, including here in Manitoba, in the Assiniboine River, as well as in the upper Nelson River.

Another thing is very important, and as Shelley mentioned in her presentation, is fishing restriction. Sturgeon do not do well with commercial fisheries, which is currently closed in Manitoba. But also even a very low level of domestic fishing can be difficult for a population to support when it is in very -- when it is basically in very, very low numbers.

The recovery in some areas has been attributed to restricted fishing. As Shelley mentioned, the Nelson River Sturgeon Board has used that as one of their tools in recovering the stocks of sturgeon on the upper Nelson River.

In general, where we do see healthy populations, that's populations where they are self-sustaining, they are associated with either

no fishery at all or a very carefully managed fishery. And we see that on the Rainy River, Lake Winnebago, and also on the Winnipeg River.

The final method that we saw that people used for recovery and mitigation measures elsewhere, that were applicable to our situation, was habitat creation or hydraulic manipulations, that is altering the flows. And by far and away the largest, the most important method is the creation of spawning habitat. And there are numerous examples where spawning habitat has been created. And for us it was of particular interest what was happening in Quebec, because there they have generating stations very similar to what we are constructing here, and they have created spawning habitat that has been demonstrated to be used by sturgeon.

Now, looking now at how sturgeon are using the existing environment. So once again this is a map that shows you the Clark Lake to Stephens Lake reach. This is the area where water levels and flows will be changed by the Keeyask Generating Station. So beginning with the start of the life stage, spawning habitat. Today sturgeon have spawning habitat in Long Rapids, up

here just below Clark Lake. They have spawning habitat in Birthday Rapids and a few locations immediately downstream. And they have spawning habitat in Gull Rapids, at the bottom end of the reach that will be changed by Keeyask.

Now, the fish lay their eggs in these reaches, and then the larval fish hatch as very, very tiny, a few millimetres long, and they drift in the river, and they drift downstream until they reach some point when they can settle to the bottom. Now, that's influenced in part by, they have a very limited ability to control where they are going, so it is largely influenced by the water velocity.

We have looked very hard for young-of-the-year sturgeon, that is those little larval sturgeon, and where they have settled. And it is actually the life stage that is the most hard to find. And I should mention that our work in Northern Manitoba on the Nelson River is actually one -- is actually the first time that young-of-the-year sturgeon were found in a large river habitat. And where we found them was actually in very, very deep river channels over a sandy bottom where there is low flow, a little bit

of flow but very, very little. And the place where we found young-of-the-year in the Gull Lake area is up here in the northern part of Gull Lake. So they would be drifting down here, the river flow splits, and some of them would end up here and they would settle to the bottom here. We also found young-of-the-year habitat downstream of Gull Rapids in Stephens Lake. Young-of-the-year habitat is also, in these areas anyway, the fish where we found them largely on sand and fine gravel.

There is an active debate amongst researchers working on young-of-the-year sturgeon. Many people believe they need sand or fine gravels, and other people think, well, you know what, they could also perhaps be surviving on silt. And that is actually going to be quite an important point in our impact assessment later on.

In terms of then as the sturgeon get older, they move from the areas where they settled as young-of-the-year fish and start using a wider range of habitats. We found some adults, that is the fish that are up to 870 millimetres in length, were quite widespread in this Keeyask area, though they did have a few pockets where they were most

abundant. So there are some areas that they seem to highly prefer, though we found them in a variety of locations.

Finally, once you get up to adults, we found them throughout this reach. They were able to use quite a wide variety of habitats.

In terms of the post-project environment, you may remember from the aquatic habitat slide that I showed you, that if Keeyask is constructed here, this area will become much, much deeper. The river channel will not be changed a great deal, though it will become deeper. So, first of all then, the spawning habitat at Long Rapids will remain. The hydraulic changes related to Keeyask stop about here, and so this will still be spawning habitat post-project.

Birthday Rapids will remain fast water, deep water, with a suitable bottom type for spawning, but it will no longer have the white water that I showed you on the slide when I showed you Birthday Rapids. So there is some discussion about whether sturgeon will continue to use such habitat or not.

Looking further downstream to Gull Rapids, Gull Rapids will no longer be spawning

habitat. Part of the rapids is going to be flooded under about ten metres of water, part of the rapids will have the generating station itself on it, and then this south channel will be dewatered, basically dewatered river bed.

In terms of the young-of-the-year habitat, I showed you the area here on the northern part of Gull Lake. This area will no longer be accessible because sturgeon that may be -- where eggs may be laid and they start drifting downstream, the water through Gull Lake will essentially be a very low flow, such that drifting larval fish would not be able to reach the area. In addition, we expect fine sediments to settle over this area of sand, so it may also no longer be suitable. However, the young-of-the-year habitat down on Stephens Lake will not be affected, so it will still be available post-project.

The other thing that will be happening is that the generating station itself will be blocking or altering sturgeon movements. Obviously, unless you provide passage, they will not be able to go upstream. In terms of moving downstream, the larval drift will no longer occur

through the reservoir just because the water velocity is very slow. The fish that are approaching the generating station and looking to move downstream would either need to go through the turbines, if they are small enough to pass the trash racks, or they would go over the spillway.

So I have mentioned that our strategy for developing mitigation then is to construct or to provide habitats if they are not available. So I showed you that in terms of the downstream environment, what we are losing is the spawning habitat. And the proposed mitigation measure for that is to construct a spawning shoal based on designs that have been successfully used in Quebec. Basically, this map shows you the river channel, the generating station is this green structure, the powerhouse is blue, and then the dam is green. And post-project in both this magenta and yellow area, there would be a spawning shoal created that would consist of large boulders placed over a course substrate. And there has actually has been a lot of design work done on this, where the engineers or the engineering team used three dimensional hydraulic modeling to better understand how the flows will go over the

structure, because we feel that sturgeon need a very specific pattern of turbulent flow in order to attract them to an area to spawn and successfully lay their eggs.

We also will have along this part of the tailrace and extending at the bottom end of the tailrace, there will be some remnants from the cofferdam. You may remember from the project description that cofferdams were being constructed to build the station. Most of those will be removed but there will be course rubble left. And we see in places like Pointe Du Bois that sturgeon also use that kind of course rubble.

And in the bottom here is a photograph of two sturgeon spawning downstream actually, along, close to, at the Limestone Rapids. This is a photograph taken from an island. You can see this coarse kind of rock. This is the kind of material that they are spawning on.

Now, one of the things that we have put a lot of time and effort into is trying to determine how much spawning habitat do you need to create? I mean, we have got rapids that are three kilometres long. We have an enormous potential area that sturgeon may spawn. We know that they

are only using a very, very small part of the habitat in Gull Rapids.

During non-spill periods, sturgeon in Stephens Lake would need to rely on the constructed spawning habitat, and there is a plan to construct up to about three hectares. When the generating station is spilling, because there is a lot of excess flow in the spring, at high flows about another 3 hectares of habitat would be suitable below the spillway.

So the question that's been our challenge is how much spawning habitat do you need? We know that what we are creating is less than what is in the existing environment. But we've also looked at other areas, for example, at the Pointe Du Bois Generating Station, there is downstream a population of a couple of thousand sturgeon. And there have been very detailed and extensive studies done on the spawning at below Pointe Du Bois as part of the redevelopment project there. And because there is such a large population, you can do some very detailed work to determine where sturgeon are spawning, laying their eggs. And we found that the actual area they use is less than one and a half hectares. So

we feel that if we are creating an area of up to three hectares, if you know that in a population where there is a couple of thousand sturgeon, one and a half hectares is sufficient, we feel this is good evidence that we are creating sufficient spawning habitat.

In terms of the upstream spawning habitat, this is a photograph of Birthday Rapids. And as I mentioned, the water levels will increase here. It will still become very, very swift, but you will no longer see this white water. There has been some debate amongst sturgeon biologists about whether sturgeon need white water to attract them to areas to spawn. We know in flooded rapids upstream of the Kelsey generating station, the sturgeon have continued to spawn. So the plan for this area is to basically monitor the post-project, and see if sturgeon still spawn in this area or not, and if they don't, look at perhaps creating some structures on the edge to create this kind of turbulent flow.

It is important to remember for the reservoir that spawning habitat will still be available definitely upstream of Long Rapids, because that area will not be altered.

When I was discussing the habitat in the reservoir, I did flag that we will be losing the existing young-of-the-year habitat. Young-of-the-year is probably the most challenging life history stage to work with lake sturgeon. As I mentioned, they are very hard to find in the wild, and it is the life stage that's understood the least well. At the moment what we propose to do is monitor a post impoundment, to see whether or not there will be suitable young-of-the-year habitat in the reservoir.

This is a cut-out map that basically shows you the upper part of present day Gull Lake. So here is the Nelson River, and this is the first basin of Gull Lake. Post project, based on the hydraulic modeling, the water velocity conditions right at this upper end will be suitable for where we think larval lake sturgeon would settle out, and where you would need to have suitable habitat for them in order for them to survive and grow up.

Currently, the predictions are that the substrate in this area, the bottom, will just continue to be as is, it will be coarse rock. And that may not be suitable for young sturgeon. And so the engineering team has developed a

contingency plan whereby they would be placing sand in some parts of the deep river channel where we believe the young sturgeon would settle, if we find that the habitat without any kind of mitigation measure is not suitable.

Now, the last effect that I mentioned to you when I was going over that slide was the effect of the generating station as a barrier. Now, this is true for all of the fish species, all of the VECs fish species that I discussed. But of all of the species, sturgeon have showed the most movement over the rapids and so are the most concern to Fisheries and Oceans Canada. In terms of upstream movement, if fish passage is not provided, upstream movement would be blocked by the generating station.

There is currently the acoustic study, which started in 2011, as well as studies that were done about a decade earlier, demonstrated that about 20 per cent of our tagged sturgeon move upstream. Now, though that sounds like a fair bit, I should point out in the current study, for example, we have managed to tag about 30 sturgeon downstream. We are talking about 5 sturgeon have moved upstream. We don't have any evidence that

they are moving upstream to support a specific life history requirement. For example, it is not as if they are migrating upstream over Gull Rapids to Birthday rapids to spawn in the spring. Currently, most of the movements that we see are late summer or early fall. As I say, there is no definite reason that we have been able to find as to why they are moving.

In terms of changes to downstream movement, as I mentioned, creation of the reservoir will prevent larval sturgeon from drifting through the reservoir, and that's an unavoidable effect.

In terms of the adult movements, some adult movements there is the potential for those fish to be killed or injured when they go downstream via the spillway or the turbines. We are finding, in contrast to the number of fish moving upstream, we are finding far, far fewer moving downstream in the current environment. Actually less than 5 per cent of our tagged adults have moved downstream. And looking at over a thousand fish, sturgeon that we have put floy tags on, so those spaghetti tags on, over the last decade, I believe that we have caught -- less than

two per cent have gone downstream. So very, very small numbers.

Now, the effect of barriers on lake sturgeon is an area of considerable interest to people who work on lake sturgeon, and obviously to people who want to build generating stations. Now, there are some researchers who have indicated that sturgeon require greater than 200 kilometres of unobstructed river habitat to support a self-sustaining or a healthy population.

Now, we have many examples here in Manitoba and elsewhere where there are healthy populations, that is good, with good numbers and that are self-sustaining, in much, much smaller reaches. And the best documented one and the one that we are most familiar with is the ten kilometre long reservoir below Pointe Du Bois, which as I mentioned supports over 2,000 sturgeon. And really the key factor is the availability of habitat to support all life history functions.

So, as you can gather from my comments, this has been something that we have been discussing very actively between the Partnership and the Department of Fisheries and Oceans, and also Manitoba Conservative and Water

Stewardship. And most recently in a correspondence that DFO provided this summer to the Partnership, and it was also attached to one of the IRs provided to the CEC, DFO indicated that it could not determine at this time whether or not fish passage is or is not required. So they indicated that they will require a contribution from monitoring and the implementation of passage as a retrofit, if both DFO and MCWS determine that it is required based on the results of that monitoring.

Now, what DFO has required is that the Partnership provide, or develop some provisions for retrofits if it is found in the future that upstream fish passage is required. So the Partnership has identified options that could be used for upstream passage, and those include a conventional fish ladder, a trap and transport system in which sturgeon are basically collected downstream and then moved upstream using either a truck or a boat, or a nature like bypass channel. And the last method is not that common in our area, though it has been used fairly widely in Europe, and that's basically developing a small stream in which the fish can swim up and around.

But you can imagine in the Keeyask area, because it is a very large change in elevation, that small stream would be in the order of five kilometres long. So it would be a very large undertaking.

And basically there is a flexibility, or in the project planning they are maintaining the flexibility to construct any of these methods as retrofits. And what would be done is that post project there will be monitoring. And the first step in the monitoring will be to determine, basically, is the mitigation that's being applied for as is without passage sufficient? Basically are sturgeon successfully recruiting both upstream and downstream of the generating station, so that they are spawning, the young-of-the-year are surviving, the juveniles are growing up and the adults have adequate habitat.

So can the system function as two separate areas, which is basically in the Partnership's proposal? If it is found that it actually doesn't work, or if there is some other evidence that, yes, indeed it would be better for the sturgeon population if they were connected, you would need monitoring in order to develop the best possible fish passage method. The first

question would be, what parts of the reservoir are the fish, in this case the sturgeon using? Because you need to know in developing your fish passage system, do you want a passage system that's introducing them immediately upstream of the station, or do you want a passage system that maybe is transporting them further upstream to that river habitat that I showed you earlier on.

The other piece of information that we cannot obtain until the station is constructed is, what would be the best type of fish passage to construct? And one of the critical features in a fish passage system is where in the downstream environment should you be collecting the fish? Where should you develop basically the entrance to your fish way? And that is something that you can't see until you do monitoring in the downstream and see how the fish are actually responding to changed flows downstream of the station.

In terms of downstream fish passage, the turbines have been designed to reduce injury and mortality. This is the first Manitoba Hydro station where criteria to improve or to decrease adverse effects to fish have been included in the

turbine design specifications. And two of the most important are to have turbines that rotate more slowly and that are larger. And based on the work done by some specialists in turbine effects, there is a prediction of over 90 per cent survival for fish up to 500 millimetres in length.

Now, the survival of larger fish, which includes the majority of lake sturgeon, would be lower. And actually I will get to that in a subsequent slide. Basically, there will be post project monitoring to determine what the actual effects are in terms of downstream passage.

Now, here is a photograph actually of the turbine at the Kelsey Generating Station when these were being replaced, and this is just to give you a better idea. They are essentially giant propellers, and you can see that this actually, I mean, some of them are basically as wide as a small house, so they are very, very big. So fish that are moving are entrained in them, may either go down basically with the main part of the flow, and fish basically become injured if they hit a part of the turbine, either the blade or some other part, the leading edge or some other part of the blade. So if it is bigger, there is a

greater opportunity for fish to move through without hitting it, and if it is moving more slowly, there is a greater chance for fish to get through basically without being hit.

When we are considering the effects to the sturgeon population, it depends first of all on the number moving downstream. As I said, in the existing environments we are finding a very, very small percentage of the sturgeon are moving downstream. So the potential effect to the population of turbine mortality is very small.

The second important criterion is how many of the sturgeon, for example, would survive going through. There has been experimental work done on other fish, but not on -- we haven't done any experimental work on adult sturgeon. We do have a record of about a dozen sturgeon, about 10 sturgeon that have actually been tagged and have gone through generating stations on the lower Nelson River. The majority of those have survived. Now, some have gone through the spillway and some through the station.

The last point is, in terms of population effects, it is important how many sturgeon are being born upstream and downstream of

the station. Because the importance of a few sturgeon dying depends very much on how many sturgeon are being born. So all those three factors are going to be looked at during the monitoring to determine the importance of mortality associated with turbines.

Now, the Partnership is also working on means to identify, or working to identify means to address potential issues. Because when there is uncertainty, the approach always is to figure out, well, if the situation is worse than you expected, what are you going to do about it? Now, the engineers have been looking at a variety of things. One of the things they are looking at is modifications to the trash racks, which would determine what size of sturgeon could even reach the turbines. What they have found, though, is that a bypass structure, that's basically a downstream way of passing sturgeon through the station, is not feasible, it's not technically feasible.

Now, I'm going to move on to the last and perhaps the most important mitigation program being developed for the Keeyask project, and that is the stocking program. The stocking will

maintain the total abundance and increase the year classes in both the Keeyask reservoir and Stephens Lake. And that will address the cumulative effects associated with the project like reduced spawning during construction, the potential immigration of older sturgeon either upstream or downstream at impoundment. And also I have often mentioned, you know, we are going to look to see if we should construct young-of-year habitat, monitor it and so on. There might be some fine tuning required for these constructed habitats, and we don't want to have those all be periods during which no young sturgeon are entering our population. So for all those reasons we would be stocking. And additionally, stocking would be used to supplement the existing very, very small populations in these areas.

In addition to just looking at the Keeyask project, because the Partnership was interested in showing that they would be able to have a net benefit to the sturgeon populations in this area, there also will be stocking done at a regional scale, in particular in the area that I showed you in the upper Split Lake area, Burntwood, Grass and Nelson rivers. We know

looking at historic accounts that there are fewer sturgeon there today than there were historically. And from habitat surveys, we also know that there is much more habitat than there are sturgeon today. And that is actually the same conclusion that the Nelson River Sturgeon Board came to for looking at the Nelson River upstream of the Kelsey Generating Station. So habitat in this area will not be affected by the Keeyask project, but it is another place where the Keeyask project will be supporting the stocking of sturgeon.

Now, the main features of this conservation stocking program is either developing another hatchery on the lower Nelson River, or looking at continuing to use the facilities at the Grand Rapids hatchery, which Shelley described to you. It is very important to use the local fish to supply the brood stock, because, as I showed you on that slide way at the beginning of this sturgeon presentation, basically the sturgeon in Gull Rapids are different from the sturgeon in the Burntwood/Kelsey area. So if at all possible, we would like to maintain those as separate genetic stocks.

The stocking program would also

release a range of ages of fish from larvae to fingerlings to yearlings, that is one year old fish. Each of these life stages has both advantages and disadvantages. Basically, the younger the sturgeon are released, the higher the mortality, but also the less time they will have been subjected to the artificial conditions in the hatchery.

The program is also going to be very long term. It will be at least 25 years. Because when you are stocking and you are putting young fish into the population, you want to have basically a whole generation. And sturgeon have a generation time of 25 years, and so it is a very long-term initiative. And it may actually be longer than that. We will be looking at how is the population doing in determining how the stocking would continue. And the long-term objective of that population is to create a healthy -- that is a self-sustaining population. There is not -- the objective of this stocking initiative is not to essentially create a put and take fishery, where you just stock them in, you fish them out or you lose them. You want to have one where it is a self-sustaining population so

you don't have to stock in perpetuity.

So looking at the net effect of the Keeyask project on sturgeon, during the construction period measures to protect fish will reduce the risk of mortality. Adult fish may leave Gull Lake due to construction disturbance or water level changes. The proposed habitat mitigation measures -- proposed habitat mitigation measures will address operation effects. And the objective there is to provide habitat to support the self-sustaining sturgeon populations in the Keeyask reservoir and Stephens Lake.

In the long term, there is also the long-term conservation stocking program. The intent of that program is to maintain the existing populations as constructed habitat is fine tuned, and that gives our entire mitigation program a great deal more certainty. Because we know that sturgeon can be supported through a stocking program, so that even if in the first decade we still need to do fine tuning of our young-of-the-year habitat, we have that luxury. It is not as if the natural sturgeon will disappear while we are trying to fine tune our constructed habitat.

Also, we will re-establish a viable stocking population in Stephens Lake. Today that population is simply not viable, there is very, very few sturgeon, and the majority of them come from one -- they are very young sturgeon and most come from one year class. It will support our existing sturgeon population in Gull Lake, and it will support the recovery of the sturgeon population in the upper Split Lake area where the habitat is not affected by Keeyask.

Now, here is my almost to last slide on lake sturgeon. Looking then at the cumulative effects, I have here a square that shows you where the sturgeon population will be potentially adversely affected by the Keeyask project, that is in the Keeyask reach, and in the Stephens Lake. And as I indicated, these effects would be just during the construction period, just before we are able to implement some of our mitigation measures. And we know, because we have talked about it, that these projects are being developed in an environment where sturgeon have been already impacted, which is why we have taken the approach of basically finding ways to increase the existing sturgeon population.

When we look at other developments, for example, further hydroelectric development at Conawapa, we don't see an overlap between the adverse effects of the Keeyask project appear and, you know, any effects that would be associated with Conawapa.

In addition, the other future developments that were considered in the cumulative effects assessment, such as the development of transmission lines, are not going to affect lake sturgeon habitat. So there is no potential for a cumulative effect there.

So in summary then, during construction, adverse effects to Gull and Stephens Lake populations are predicted due to immigration. During operation we expect to maintain or increase the numbers in the Keeyask Reservoir and Stephens Lake due to habitat creation and stocking. We expect an increase in the population in upper Split Lake due to stocking. And we haven't identified any future developments that have the potential to overlap with the adverse effects of the Keeyask project.

So, in conclusion, an overall increase in sturgeon numbers in the Kelsey to Kettle reach

is expected in the long term, and that's largely due to stocking, as well as the fact that the area directly affected by Keeyask will continue to have suitable habitat for all life history stages.

Now, the very last part of my presentation is the monitoring and follow-up. The aquatic effects monitoring plan has the basic objectives of all aquatic -- environmental monitoring plans. It is to verify effect predictions in the EIS, to identify unexpected effects, to determine the effectiveness of mitigation, assess the need for doing more mitigation, and determine the effectiveness of any of the additional or adaptive mitigation measures, and finally to confirm the compliance with regulatory requirements.

This program is being developed in very close consultation with both Manitoba Conservation and Water Stewardship and DFO. There is a draft that has been placed on the Partnership's website, which was actually provided to the agencies about a year ago. We have had a variety of meetings to discuss further developments with them. So we expect the next draft that's created will reflect more of their

comments, as well as input from other stakeholders.

The annual results will be reviewed by the Partnership at the monitoring advisory committee, and it will also be reviewed by DFO and MCWS, and both the regulators will base the requirement for additional mitigation, for example, fish passage, on the results of that monitoring.

We are looking at many of the same components that I discussed with you today, water quality, aquatic habitat, aquatic invertebrates. The fish community will focus on walleye, pike and whitefish, as well as sturgeon, and finally the mercury in fish flesh. That will actually be developed to provide the necessary inputs into the information being provided to resource users that you will hear about in the socio-economic panel.

I'm just going to talk very briefly about the lake sturgeon program because -- just for reasons of time. It starts off with a pre-construction program, as I mentioned, the adult population size has been, work has been ongoing since about 2001. Recruitment monitoring, that is looking at whether there are young fish in

the environment, was started in 2008. Adult movements, the program for the construction period started in 2011, with the application of acoustic tags that will have a ten-year lifespan, so it will allow us to look at sturgeon now and right through the construction period. And finally sub adult movements, and we have applied three-year tags this year.

During the construction period, which will last about five to six years until the full supply level is reached in the reservoir, for the aquatic studies that is the construction period. I know that there will be some work continuing in the station for a couple of years thereafter, but in terms of the aquatic environment, once the land is fully flooded, we move into the operation monitoring.

And finally during operation, there will be an initial program that will be run for three years, there will be review to see if it needs to be refined. It will be refined, then it will continue on until year 10, at which point there will be another review, and then the duration in the long term will depend on the results and vary among components. For example,

looking at lake sturgeon and how the stocking program is doing, that will be a program that will be for over 25 years.

Now, there are four basic components. The first is what we call adult and sub adult spring netting. I explained to you that we do this netting to obtain the population estimates, and it is done in alternate years in upper Split Lake and the Keeyask reservoir and Stephens Lake. And this work has actually been ongoing since 2001, so we already have a very good idea of what you should be seeing in the existing environment. We will use the results to continue to generate population estimates, so that will tell us information about long-term population changes, and also whether there is something unexpected happening. Like, are we getting an increase in adult mortality for some unanticipated reason? It also tells you their condition, in other words, how fat they are. Fish are fortunate in that the fatter they are, the better it is. So that's one thing you monitor, as well as their growth data. And that will tell us a lot of information about whether the feeding conditions in the reservoir are suitable. We are predicting that the habitat

will be good, but we want to confirm that.

We are also going to continue to do a great deal of acoustic telemetry studies. This is the movement work that's ongoing already. It allows you actually to look at where the sturgeon are going year round, because in some locations you can leave your receivers in the water for the winter. In some places due to ice conditions, you can't. It will give us a much better idea of what it means to have the generating station as a barrier. How are the fish responding to the generation station from the downstream end, and how many fish are actually going downstream past the generating station and what is happening to them? This is probably one of the best ways of determining what the actual turbine effects are. Because rather than experimentally introducing a fish into a turbine, you are seeing in the natural environment how many choose to go downstream and what happens to them.

The telemetry work is also very valuable in getting a much more refined idea of habitat use in the reservoir and downstream. And are they using those constructed habitats? You know, we are creating spawning habitat, do we have

fish with tags, with acoustic tags on them that are going in to use those habitats?

The recruitment monitoring, this is a term that we are using for studies actually targeting young fish, so that is the young fish at the fall, and also we see them again as one and two year olds. And this is a very important program because it is one of the most immediate measures of effects to lake sturgeon. It tells you, are young fish present, are they surviving and are they growing. And you will notice that many of our -- it will tell us if our post-project habitat is suitable, because we weren't certain about that. It will tell us how effective our constructed habitat is. And it will also tell us how successful is our stocking program? And in particular for the stocking program, there are questions about how many sturgeon should you stock? You don't want to stock so few that none survive, and you don't want to stock so many that they are actually competing amongst each other and not having enough space or food, for example, or you see evidence that they are either too small or not growing well enough.

We are also going to do some very site

specific sampling on the constructed habitats. For example, if we see evidence of sturgeon spawning in our tailrace area, we may be looking at trying to determine where exactly they are spawning by placing eggs mats or other methods that we have used at Pointe Du Bois.

Monitoring will also occur on other habitats that might be constructed. For example, if we develop young-of-the-year habitat in the reservoir, you would do a very specific targeted program for that.

And that brings me to the end of my presentation. Thank you very much for your attention.

THE CHAIRMAN: Thank you, Ms. Schneider-Vieira.

Once again, your timing couldn't be better. It is time to break for lunch. We will return at 1:30

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

THE CHAIRMAN: We'll reconvene now. Cross-examination, Ms. Whelan Enns.

MS. WHALEN ENNS: Thank you, Mr. Chair. I have a wealth of resources here so

I'll do my best to be clear, speak quickly without being too quick. Wave your hand, please. And I wanted to start by going back to the topic of the 2005 water levels and amount of water in Northern Manitoba from yesterday afternoon. We heard that there was 70 percent more water input into the system in 2005 than in a normal year. And that included the North Saskatchewan River based on presentations in MKO sessions I was in.

So the question then would be, given the amount of flooding in 2005 inside the Split Lake community, whether the statements in the EIS that there would be no measurable effects to the project, aquatic project in this case, from climate change, whether it's the view of the panel that's still true? We're talking about the Split Lake community being flooded in 2005. And yes, Mr. Chair, I've got the photos, should there be a need to see them.

MS. SCHNEIDER-VIEIRA: The Split Lake community was flooded in 2005 as a result of high inflows to the system. The Keeyask Generating Station is being developed well downstream of Split Lake, and there's been extensive analysis of the water level profile, as you heard during the

physical environment and project description presentation, such that there would be no effects of the Keeyask project on open water levels in Split Lake.

MS. WHALEN ENNS: Thank you. Did the team or panel for the aquatics elements in the Keeyask generation project EIS take into account the prairie provinces water sharing or water management agreement, in your analysis?

MS. SCHNEIDER-VIEIRA: The aquatic environment assessment used the information provided to us by the physical environment team in terms of hydraulics, that is the existing and post-project water regime So a question about how they, you know, how they developed their water regime would need to be directed to them.

MS. WHALEN ENNS: This question has to do with discussion with that panel, including a question from the Chair yesterday regarding glacial melting. So there were a variety of things from yesterday's panel that in fact were identified to come to this panel. So shall we take that as a no, that the prairie province's water management agreement was not taken into account?

MS. SCHNEIDER-VIEIRA: I'm advised that one of the engineers who worked on the water regime is not familiar with that specific agreement.

MS. WHALEN ENNS: Thank you.

It does dictate what portion of the water coming from British Columbia across the three provinces comes into Northern Manitoba and Southern Manitoba.

Does Manitoba Hydro view the Nelson River as a shared river? This would be within the context of the World Commission on Dams definition?

MR. DAVIES: Could you please tell me what you are -- I'm sorry, I'm unclear on the question. The World Commission on Dams is quite an old document. I read it about ten years ago. Can you please expand on that, please?

MS. WHALEN ENNS: Sure. Vice-president Ken Adams of Manitoba Hydro put the World Commission on Dams report into the hearing proceedings on the first day. And there is in the World Commission on Dams then a set of steps in terms of a compliance plan for the recommendations in the World Commission on Dams report. And there

is quite specific standards then in terms of shared rivers.

I think, Mr. Chair, we're probably not going to get farther.

THE CHAIRMAN: Is that relevant to this panel?

MS. WHELAN ENNS: It's relevant to the Nelson basin.

THE CHAIRMAN: Yes, but this panel is talking about aquatic effects of the generating station.

MS. WHALEN ENNS: All right. We'll pass, thank you.

THE CHAIRMAN: Please move on.

MS. WHALEN ENNS: Okay.

There is a series of slides in the presentation which refer to monitoring programs and reports from monitoring programs over about a 40-year period. Could you tell us whether those reports that are referenced in the presentation are all publicly available?

MR. DAVIES: Could you please direct us to which page you are on?

MS. WHALEN ENNS: I believe they start to be listed on page 12, the section is historic

studies. So there's a page that identifies and starts a chronology in 1971.

MR. DAVIES: You're referring to my presentation then?

MS. WHELAN ENNS: Yes.

MR. DAVIES: Okay.

That's in the public domain, and there's a number of studies that were actually conducted prior to the Lake Winnipeg/Churchill Nelson River Study Board that are attached to those, most of them by Department of Fisheries and Oceans. And those are also in the public domain.

MS. WHALEN ENNS: Thank you.

The question then also applies to the Canada/Manitoba Mercury Monitoring Program and the series of Manitoba Hydro and DFO mercury studies.

MR. DAVIES: Virtually, I believe all of them, to the best of my knowledge, are available to the public.

MS. WHELAN ENNS: Thank you.

MR. DAVIES: Actually, I should make one exception. There is some recent information that's being collected in 2012, 2013, that may not be published yet.

MS. WHELAN ENNS: It would be a

continuation then of one of these studies?

MR. DAVIES: That's correct.

MS. WHALEN ENNS: The same thing is true then in terms of the Limestone Generation Station monitoring studies, those are available?

MR. DAVIES: I had said there's 70 reports in total, there is actually about 80 reports, although those studies are also available.

MS. WHELAN ENNS: Thank you.

MR. DAVIES: I should clarify that a bit. When I say available, they have been provided to the Provincial Government, in many case to the Federal Government, and therefore we considered them in the public domain.

MS. WHELAN ENNS: Yes, it would be considered in the public domain. That doesn't get us quite to whether they are publicly available. The legislative library my be a thought.

Does Manitoba Hydro post on their website the ongoing reports from monitoring programs?

MR. DAVIES: The main monitoring program that we spoke about before was the coordinated aquatic monitoring program. There is

a site developed and it's currently being populated with information from the CAMP program.

MS. WHELAN ENNS: And it will be a public website rather than internet?

MR. DAVIES: It's a public website.

MS. WHALEN ENNS: Great, thank you.

I think the first full page map in this presentation is on 14; is that correct? Is that the first map?

MR. DAVIES: You're referring to the map with the mercury site locations?

MS. WHELAN ENNS: Yes. I have some questions pertaining to the maps and the presentations. So the next several slides have to do with certain of these environmental monitoring programs and sets of reports. And then the next map is on page 20.

MR. DAVIES: Right.

MS. WHELAN ENNS: Again, to identify a couple more and then to ask some questions. Page 22 and page 23, we have a pattern that I'd like to ask about, and that is some of these maps have titles and some do not. Some of them have legends and some do not. Is there a reason for that?

MR. DAVIES: I believe that the first

map, the fish mercury site locations in Northern Manitoba -- I'll just check this with Dr. Jansen -- I believe it's a map that he put together for one of his presentations. He is one of the leaders on mercury in Manitoba.

MS. WHELAN ENNS: And this first map is single topic?

MR. DAVIES: That's correct.

MS. WHALEN ENNS: And it does have a title, single topics less likely to need a legend.

MR. DAVIES: I'm not sure what the value of whether or not it has a legend, but it was a map produced by, I believe, Dr. Jansen. One moment, please. Yes, it was. It was produced for a presentation that he provided at a mercury conference.

THE CHAIRMAN: Could you pull the mic in a little closer, Mr. Davies, please?

MR. DAVIES: Yes, sorry about that.

MS. WHELAN ENNS: Thank you.

The map on then page 20 does not have a title, does not have a legend, and it has about eight, maybe ten colours on it?

MR. DAVIES: The title, probably it got clipped off. This is one of the maps from the

coordinated aquatic monitoring program, and I believe that map is actually on the public website.

MS. WHALEN ENNS: On 22 we have a legend but not a title; on page 23, the same; on page 24, the same; on page 25, the same approach.

So we have, Mr. Speaker, I'm basically asking questions because it's fairly unusual to see the set of maps in this kind of proceeding without titles. And the second half of the presentation, they all have. So we have got some -- I don't know the reasoning, or whether there is reasoning for it.

MR. DAVIES: These maps were prepared specifically, and updated to 2012 specifically for this presentation. So if there's a title that's missing, we apologize for that.

THE CHAIRMAN: As I recall from the presentation earlier, they were clearly identified as areas where different studies had been conducted.

MS. WHALEN ENNS: Yes.

THE CHAIRMAN: And I think the four or five of them are just different parts of Northern Manitoba.

MS. WHALEN ENNS: Fair enough. Thank you.

And thank you for the date on this one. When a legend is missing, often the date is missing, and the maps have a long life and are likely to be referred to.

This is a reference then to slide 38, though there have been -- I believe page 38 would be a better way of saying that. I am sorry, but we've got both page numbers and slide numbers, so let me see.

MR. DAVIES: My presentation only goes up to slide 32, so I imagine you must be on Dr. Schneider-Vieira's; is that correct?

MS. WHALEN ENNS: Yes, I think so.

There's a bit of a risk of having put down the slide number versus the page number. My question has to do with the references to Manitoba and Canada guidelines.

MS. SCHNEIDER-VIEIRA: Yes, I believe you are referring to in the water quality slide, is that correct?

MS. WHALEN ENNS: And what's the other number on it?

MR. DAVIES: I'm sorry, but both

Dr. Schneider and myself are somewhat confused. Which slide are you on? Are you referring to the mercury slide or the water quality slide?

MS. WHELAN ENNS: Water quality slide.

MR. DAVIES: Which number?

MS. WHELAN ENNS: Well, I have 38 on it, which might be page number versus the slide number.

THE CHAIRMAN: Either way, it's a wrong number.

MS. WHALEN ENNS: Yes, thank you. My apologies.

So if I may, I'll pose the question, because this is a sequence of slide and references to water quality guidelines. And the question has had to do with the Manitoba guidelines. Are they, in fact, a regulatory guideline versus a voluntary?

MS. SCHNEIDER-VIEIRA: They are the Manitoba water quality guidelines, standards, objectives, and guidelines put out by Manitoba Conservation and Water Stewardship. The standards portion dictates what type of, basically, levels of substances and effluents.

MS. WHALEN ENNS: Okay. The question

was whether they are regulatory?

MS. SCHNEIDER-VIEIRA: They are regulatory guidelines, but they don't set absolute limits of what a substance can be in the environment. Because, as we noted in our material in the EIS, there are several substances that are actually above the guidelines currently in the northern environment.

MS. WHELAN ENNS: We would agree that in 2011, they were placed as a regulation under the Water Protection Act in Manitoba?

MS. SCHNEIDER-VIEIRA: Yes, they were.

MS. WHELAN ENNS: Thank you.

MR. DAVIES: Actually, I would just like to add. When we say that some of them are above guidelines, we are referring to things like aluminum, which is one of the most common elements in the world actually, and aluminum is above the guidelines in both impacted and non impacted water. So it's very common.

MS. WHALEN ENNS: Thank you.

The distinction between what's a required or regulatory and what's a set of goals is the reason for the question.

MS. SCHNEIDER-VIEIRA: While we have a

brief pause, I just wanted to note that you had asked earlier about the interprovincial agreement. So I just want to note that, yes, you are correct that it does define what proportions of water can be kept by the different provinces and that agreement is factored into the flow files that were used by the physical environment team.

MS. WHALEN ENNS: Thank you very much.

It's a matter of water kept, and also water that has to be accepted in Manitoba at the pipe, in terms of the proportions in the agreement, hence the question.

Having one booboo with page numbers, I'm going to try again, and this has to do with data collection. And I'm on page 42, slide number 10. And I'll have to do that because I didn't write them both down.

There's some references in this, it also goes to what was in the previous slide, so there's references for slides, but there's a reference here to 2001 to 2004 in terms of the basic work, and on components, okay. And I would like to ask whether there's any data that's ten years old now, or whether our sense is clear that there's been ongoing collection of data in all the

areas that are there from the basic work?

MS. SCHNEIDER-VIEIRA: I'm going to answer it component by component. For the water quality data, as was mentioned, we redid a set of sampling in 2009 in the Keeyask area. Also there is ongoing water, collection of water quality data in Split Lake, both by the province and as part of the CAMP program. The CAMP program also regularly samples water quality in Stephens Lake.

In terms of the benthic invertebrates, we sampled during that period, and we will just prior to construction next year repeat the sampling within the reservoir. As with water quality data, as part of the CAMP data we do regularly collect benthic invertebrate data in Split Lake so we know whether there are changes that are happening in the system as a whole.

With respect to fish, there has been ongoing monitoring of the various groups of fish. In particular, as I have discussed, lake sturgeon have been sampled throughout quite extensively. And as our understanding of sturgeon has developed, we have adaptive programs. For example, the recruitment monitoring began intensively in 2008, after we were able to

successfully sample or collect young-of-the-year sturgeon.

MS. WHELAN ENNS: Thank you very much.

Is it an accurate assumption then that the collection of data and monitoring continues now, will continue through construction and through operation in these components?

MS. SCHNEIDER-VIEIRA: Yes, that would be correct. The duration of the programs, as well as the frequency, will vary amongst the components.

MS. WHALEN ENNS: Thank you.

I am on page 47, slide 15. And this is a question in terms of effluent. The EIS is fairly thorough about the sewage treatment plant that will be put in place once there is a generation station. So it's not absolutely clear to us then from IRs and information to date what the stages of effluent treatment are through the stages of construction and operation. What's the interim sewage treatment arrangement, and will Keeyask Lake be used for effluent?

MS. SCHNEIDER-VIEIRA: Let me just consult with someone in the back row, please?

THE CHAIRMAN: Ms. Whelan Enns, to my

knowledge, it's quite clear in the EIS what the sewage treatment is going to be during the CAMP stage.

MS. WHALEN ENNS: Yes, I wasn't just asking about the CAMP stage, I was asking about the construction period.

THE CHAIRMAN: Well, the CAMP stage, I meant the construction period.

MS. WHALEN ENNS: Well, if you want us to pass, we can.

MR. DAVIES: We have an answer if you'd like.

THE CHAIRMAN: They have an answer so we may as well hear it, but please don't ask questions that you clearly know the answer to, or should know the answer to if they are in the materials.

MS. SCHNEIDER-VIEIRA: It's just been noted to me that the sewage treatment system that will be used for the construction camp will discharge to the Nelson River main stem, and in fact it already has a Manitoba Environment Act licence that's been issued under KIP.

MS. WHELAN ENNS: Thank you. I'd like to ask some questions about Stephens Lake, your

maps are quite clear and helpful in terms of forming these questions. There is an indication that Stephens Lake, in your presentation today and in the EIS, became a reservoir as of 1970, correct?

MS. SCHNEIDER-VIEIRA: There about, early 1970s.

MS. WHALEN ENNS: So do you have then baseline aquatic information for the Stephens Lake location before it became reservoir, and have you been using that then in comparison in terms of using Stephens Lake as a proxy for Keeyask lake?

MS. SCHNEIDER-VIEIRA: We have information, water quality data was collected early in the construction period, and through operation. To the best of my knowledge, we don't have sampling for the fish community just prior to impoundment.

You may recall that I showed you the mercury slide that had the first sampling in the '80s, that was part of the MIMP program that Mr. Davies described, and that is also when fish community information was obtained.

You may recall that I mentioned in my discussion about lake sturgeon, I said that our

historic information on lake sturgeon in what was prior to Stephens Lake becoming a reservoir was from the Fox Lake Cree Nation.

MS. WHALEN ENNS: Thank you.

You used comments and references in terms of following impoundment, and using Stephens Lake as a valuable guide, as a proxy. I'm trying to figure out the best way to ask this.

It seems that you are using a location that was not a lake before hydro development as a proxy for a lake that is going to become a reservoir. So the first site was not a lake and became a reservoir, an extensive one, that is now called Stephens Lake, and Keeyask is a lake.

MS. SCHNEIDER-VIEIRA: There are a couple of points on that. First of all, present day Gull Lake is, as I mentioned, it is actually a widening of the river channel. There is considerable flow through it, so it is very much a river like lake, if you will. In the area that is present day Stephens Lake, there was the Nelson River along the southern portion, which was separated by a river channel. It also included Moose Nose Lake to the north. You will see that on some of the maps as being an area that was pale

blue because it was water prior to development of Stephens Lake, of the construction of the Kettle Generating Station.

MS. WHALEN ENNS: Thank you, that's a help.

This is a reference to 61, and I'm going to make sure this is fish species and population trends. I'd like to ask whether any of the fish species that you assessed and that you are reporting on in the EIS, and to us today, whether you in fact did any analysis or modelled any of these results in relation to risk from climate change?

MS. SCHNEIDER-VIEIRA: In the aquatic environment supporting volume, and summarized in the response to EIS guidelines, there is a section that discusses how are the changes as a result, or the effects that we assessed as a result of Keeyask, how are they vulnerable to the effects of climate change. Would our conclusions change? And there we provided some very general information on, for example, as a result of climate change you would expect some species which favour more warmer waters to become more abundant, could even include something like sturgeon, as

well as species that are typically cool water, like lake whitefish would become less abundant.

MS. WHELAN ENNS: Thank you very much.

I would take that as a no to my question in terms of whether there was specifically modeling based on climate change scenarios for specific fish species.

MS. SCHNEIDER-VIEIRA: We didn't do any specific sensitivity analysis with respect to climate change.

MS. WHALEN ENNS: Thank you.

Would you tell us, and this is a reference to 62 following on 61 -- this was fairly important in your presentation, and it's new information in relation to the EIS contents. Would you tell us what stages or steps you went through to arrive at this decision that a fish passage system at the generation station was not required? I heard in your presentation that you said this twice. You used the term not required, and then you also described it as not being viable or doable. And again, I'm not trying to quote you, I just heard it two different ways.

MS. SCHNEIDER-VIEIRA: The issue of fish passage has been discussed even, by the

partnership, even prior to when they were a partnership. The discussions began back in the early 2000s. And at that point there was a review done of all the different kinds of fish passage, and the primary question was, is there some method out there that we know can reliably provide upstream fish passage to lake sturgeon at a station the height of Keeyask? And the answer was no.

Then when we began working, sort of more detail after the partnership was formed in 2008, the aquatic working group began to basically revisit this issue, because it is a very important issue, are you going to provide fish passage, what would be the reasons? And there was further analysis then done of the different options from a biological perspective and, you know, what could possibly work for lake sturgeon? It was a very extensive process. There were a couple of workshops even in Northern Manitoba and Thompson with all representatives from many, many community members, as well as external experts. And the output of that was that there were potential ways that you could provide passage, but given the total mitigation package that we had developed,

and that there really was not a clear benefit of providing fish passage, it was decided to basically park it at that point.

After that in I believe 2010, DFO did advise they would be looking for fish passage for this project. And that in some ways relates to their policy. They want to see fish passage where fish can move in the existing environment. And so then, you know, that resulted in a variety of other people becoming involved and a variety of methods being identified, as had been previously, and they were taken a little bit further in terms of the design. And after further discussions between the partnership, DFO, and Manitoba Conservation and Water Stewardship, it was decided that since it wasn't clear whether fish passage would provide a benefit, that the best approach would be the one that's been taken now. And that one is the one that DFO has set out in its correspondence which was provided in response to one of the CEC IRs.

MS. WHELAN ENNS: Thank you very much.

I believe that the slide on page 50, slide number 18, and I might be out by one, is the first instance where you have the red line around

your study area. Again, if I have missed one, the question is about the study area. And the information is clear, and in the volumes and in your presentation. But would you tell us what the relationship is, the aquatic study area to the RSA and the LSA, and how the decision is made to have an aquatic study area that's different from either of those?

MS. SCHNEIDER-VIEIRA: Are you referring to the RSA and LSA identified in the terrestrial environment?

MS. WHELAN ENNS: There's an RSA and LSA identified for the entire assessment?

MS. SCHNEIDER-VIEIRA: I'm going to take you back to a different slide that illustrated the study area for the aquatics.

If you go back to slide number 8, please? You will see it's labelled study area? And this was the study area --

MS. WHELAN ENNS: Excuse me, slide number 8, page 8 in the package I've got.

THE CHAIRMAN: Page 40.

MS. WHALEN ENNS: Thank you.

MS. SCHNEIDER-VIEIRA: It's labelled Split to Stephens Lake, and this basically was our

regional study area, it extended from Split Lake down through Stephens Lake, so between the Kelsey and Kettle Generating Stations. And this was the regional study area for all of the aquatic components except for water quality. Because the effects for water quality could extend further downstream, the water qualities study area extended down to the Nelson estuary.

MS. WHELAN ENNS: Thank you.

There are several references in the EIS to the lack of water quality and other kind of aquatic studies from between Split Lake and where Stephens Lake is, and that was in your presentation this morning. Would you tell us a bit more thoroughly how this has been overcome? We have the information clear in the presentation in terms of the monitoring programs over time, going back to the '70s and coming forward. But we also have this reality of a whole lot less monitoring and data from this stretch of the river.

MS. SCHNEIDER-VIEIRA: This stretch of the river was studied extensively as part of the EIS program which began in 2001. And so we were able to obtain what we believe is adequate amounts

of information to describe that existing environment.

The really important part of the earlier data from other areas, it was twofold. One is it helped us understand the effects of hydroelectric development elsewhere, which improved our ability to make predictions. The other thing it did is allowed us to basically do some analyses, for example, on the water quality data from Split Lake to determine if there are marked long-term trends and changes to water quality, because those would also affect our study area, our local, our specific area that will be affected by Keeyask.

MS. WHELAN ENNS: Were there any surprises, back-casting is not the best way to ask this, but were there any surprises when you started to study this stretch of the river in 2001, based on what you knew from the other studies?

MS. SCHNEIDER-VIEIRA: I would have to look to other members of my team. Let me just consult briefly, please?

MS. WHELAN ENNS: Thank you.

MS. SCHNEIDER-VIEIRA: My back row

assures me that there were no surprises. It was noted that we knew there was a sturgeon population there, because Don MacDonald had done the work, or the Nelson River Sturgeon Board had done the work in Gull Lake in 1995.

MS. WHELAN ENNS: Thank you.

We know that the habitat suitability index for sturgeon is part of your work, and that there is a requirement in the CEA guidelines to use that one. Are there any other habitat suitability indices involved in the aquatic species work, in your assessment?

MS. SCHNEIDER-VIEIRA: We didn't do HSI analyses for the other species. The fish habitat analyses that we did for walleye, pike, and lake whitefish was based on an analysis of different habitat types, like deep, soft bottom, low velocity. And we used GIS mapping to map the areas both in the existing and post-project environments by those categories. And then we used actual fish data, actual gill netting catches to define what the fish use would be of those different habitats.

MS. WHELAN ENNS: Has Manitoba Hydro given any consideration to importing, as in

importing and adapting for Northern Manitoba, or undertaking the work for there to be habitat suitability indices for the species in this study area?

MS. SCHNEIDER-VIEIRA: Do you mean for species beside lake sturgeon?

We did briefly discuss with the Department of Fisheries and Oceans whether they would like us to do some HSI analyses for these other species, and that didn't seem to be an area of particular interest for them.

MS. WHALEN ENNS: All right. Thank you very much.

Thank you also for the thorough information both in the EIS and in your presentation about your water sampling programs. And this includes the various programs of monitoring.

Would you tell us whether Manitoba Hydro is conducting water sampling for the Manitoba Government? Another way to ask that question would be whether or not you, in fact, provide your water sampling data to Manitoba Water Stewardship?

MR. DAVIES: Under the CAMP program,

both Manitoba Hydro and Manitoba collect water quality samples and that information is shared.

MS. WHALEN ENNS: Thank you.

On page 51, slide 19, there is a reference to 10 to 15 years in the bold, approximately the middle of the page.

Could we confirm, please, whether this 10 to 15 year period is from the beginning of construction, or it's a reference to the beginning, from the beginning of operation?

MS. SCHNEIDER-VIEIRA: As indicated in the bullet, it says:

"During operation effects to water quality in the flooded area would last from 10 to 15 years."

And what that is, basically it's timeline identified from the physical environment assessment for much of the peak breakdown and other related processes to occur. Most of it will actually occur in the first few years and then it will tail off over the following, for that first 15 year period.

MS. WHELAN ENNS: Is it accurate to say then that this is as much as a 20 to 23, 24 year period if you include the construction

period?

MS. SCHNEIDER-VIEIRA: During the construction period, effects to water quality are going to be very limited. As was indicated in the presentation, there will be a time, it will be primarily close to the construction site. And then the duration of elevated TSS extending further downstream is one to three months in each of two years. So it is not for the six or eight year construction period.

MS. WHALEN ENNS: Thank you.

In the EIS, too many numbers, but it's volume six obviously for the -- is that first of the aquatic volumes -- 6.4.3.1.2. is about residual effects and there's some reference here to near shore flooded areas having -- expected to have adverse effects in the medium term, and moderate to large effects in small geographic extents, and also then in the reservoir and several kilometres downstream into Stephens Lake residual effects that are expected to be adverse.

Has your analysis changed since this was put in the EIS? Is this still true?

MS. SCHNEIDER-VIEIRA: Could you please -- you are quoting from the response to EIS

guidelines, I believe?

MS. WHELAN ENNS: I'm double-checking the volume, okay. Yes, we're in the response to EIS guidelines.

MS. SCHNEIDER-VIEIRA: And could you provide me with the page number, please?

MS. WHALEN ENNS: 6.4.3.1.2.

MS. SCHNEIDER-VIEIRA: That's the section number, would you be able to give me the page number?

MS. WHELAN ENNS: Sorry, page 248 and 249.

MS. SCHNEIDER-VIEIRA: I'll have to search electronically. I'm sorry, my page numbers and yours don't match. Mine start with a 6 dash something.

MS. WHALEN ENNS: Yes, I assumed that. Let's try again, 6-248 and 6-249.

MS. SCHNEIDER-VIEIRA: Okay. Now we're in the same spot. Could I ask you to repeat your question, please?

MS. WHALEN ENNS: Sure. I was in a quote that starts with:

"Using the criteria established to determine significance of projects

effects for regulatory purposes..."

And then there's a reference described in section 5.5. And the rest of that fairly long sentence is what I was reading to you about expected adverse effects medium term to moderate over a small geographic extent. And then you have a sentence that, in fact, talks about how these effects will continue for several kilometres downstream into Stephens Lake and are expected to be adverse, long-term moderate over medium.

MS. SCHNEIDER-VIEIRA: Okay. This is useful that we got to this section. You may recall from my presentation that I was describing two kinds of effects to water quality. One is that effect that lasts for 10 to 15 years in the flooded area of the reservoir. And that's the first part where we say adverse medium term, that's the 10 to 15 years, and moderate to large magnitude. And that's because these are substantial sized effects in some of the parts of the flooded area.

Then the next sentence refers to the main stem of the reservoir, so that's the main river flowing through the reservoir, and extending into the southern portion of Stephens Lake. And

that is the area where we're going to see the decrease in total suspended solids, basically because the water is being slowed down in the reservoir, and some of the suspended sediments are settling out. And that is the long-term permanent effect. Yes, in answer to your question, both those conclusions still hold.

MS. WHELAN ENNS: Thank you.

I am in the aquatic environment supporting volume now. I am going to assume volume one, spatial scope.

MS. SCHNEIDER-VIEIRA: Okay.

MS. WHELAN ENNS: The section 1.2.2.5., page number appears to be 1-9.

So for those of us who aren't looking at it, the sentence says that Stephens Lake, where effects will occur because fish no longer will have access to Gull Rapids as habitat, and the main stream section will be affected by inputs from the construction and operation of the GS.

MR. DAVIES: You'll have to excuse us. It takes a little while to find the pages, it's very thick documents.

MS. WHELAN ENNS: They are.

MS. SCHNEIDER-VIEIRA: Okay. Just for

those of you who aren't looking, this is the introductory section to the aquatic environment supporting volume, and it describes the rationale for the spatial scoping of the study. And so what was just quoted is a rationale for including Stephens Lake within the study area. So that is because fish would be using that part of the -- or would be using Gull Rapids, and so fish populations in Stephens Lake may be affected, as well as the fact that there might be some downstream water quality effects due to changes happening upstream.

MS. WHALEN ENNS: And are these then also examples of effects in Stephens Lake that are short-term, or medium, and/or will be -- non scientific conversation here -- dispersed because it's in the mainstream of the river?

MS. SCHNEIDER-VIEIRA: I think that if we wanted to discuss effects, just for clarity, this was the rationale for the spatial scoping. And so here we're describing potential effects that may occur. So I think if we want to discuss effects to Stephens Lake itself, we shouldn't be doing it in reference to this specific section. So if you can let me know what, you know, what

component of the environment you want to talk about in terms of effects to Stephens Lake, we can go to that part.

MS. WHELAN ENNS: Thank you for the suggestion.

The questions have to do about concern in terms of effects in Stephens Lake, and we're fine on that set of questions. Mr. Chair, I have a couple of things on the screen in front of me left in terms of remaining questions, and then we'll be done. I wanted to let you know I'm moving to the laptop.

The first one we have covered.

The next chart I have in front of me is actually for the terrestrial volume, so we're done, Mr. Chair.

THE CHAIRMAN: Thank you, Ms. Whelan Enns.

Peguis First Nation, Ms. Land?

MS. LAND: Thank you, Commissioners. Good afternoon members of the panel. Thank you for your time and your evidence this morning. I have a few questions for you.

The first question I have is a question that my client was asking me with respect

to page 20, slide 20, which was a map showing the coordinated aquatic monitoring program. And my client's question was, looking at this information about where the monitoring is occurring in terms of the coordinated aquatic monitoring program that feeds into the data that you're tracking, is whether the south basin of Lake Winnipeg is identified on this map, and whether it will indeed be part of the monitoring program?

MR. DAVIES: If you would like, I could give you a quick review of the spots that are being sampled.

MS. LAND: That would be helpful.

MR. DAVIES: There is eight regions in total: The upper Churchill River, the Churchill River Diversion route, the lower Churchill River, Winnipeg River, Saskatchewan River, upper Nelson River, and lower Nelson River. And I'll read these rather quickly because there's actually quite a few of them. Southern and Indian Lake, area 4, which is a very large area on the top. Granville Lake, Southern Indian Lake, area 1, which is on the south part of the lake. Southern Indian Lake, area 6, which is on the southwest part of the lake. Opawatchin (ph) Lake,

Threepoint Lake, Leftrook Lake, Notigi Lake, Rat Lake, the west central Mynarski Lake, Apussigamasi Lake, Footprint Lake, Northern Indian Lake, Churchill River at the Little Churchill River, Gower Lake, Partridge Breast Lake, Billard Lake, Fiddler Lake, Churchill River at Churchill River, it's actually Little Churchill River, upstream of Pointe Du Bois, Lac Du Bonnet, Manigotagan Lake, Eagle Nest Lake, Pine Falls reservoir, Cedar Lake, Cormorant Lake, Moose Lake, Cedar Lake west basin, the Saskatchewan River, The Pas to Cedar Lake, Cross Lake west basin, Setting, Playgreen Lake, Little Playgreen Lake, Walker Lake, Sipiwesk Lake, Nelson River downstream of Sipiwesk Lake to Kelsey, Split Lake, Assean Lake, Nelson River main stem, Hayes River, Stephens Lake north arm, Stephens Lake south arm, Limestone Forebay, Burntwood River First Rapids to Split Lake, Lake Winnipeg and Lake Winnipegosis. And Lake Winnipegosis is being sampled actually as the off system lake.

MS. LAND: Sorry, what was the last thing you said?

MR. DAVIES: As you noted, there were lakes that were off system that were also being

sampled for comparison reasons.

MS. LAND: Okay. So I'd like to ask you some questions about algae issues, believe it or not. So I'm going to start by taking you to page 54 of the handout.

MS. SCHNEIDER-VIEIRA: Do you have the slide number, please?

MS. LAND: Which was slide 22 of the -- I can't remember which of your presentations it was. It's not listed at the top. It's the aquatic environment slide.

So the slide is on algae, aquatic plants and invertebrates. So I was comparing this information to the data that I saw in the supporting volume on aquatic environments. And my understanding in the supporting volume's evidence is that western science showed that there are more common occurrences of algae in the Burntwood River, Split Lake, Clark Lake and Gull Lake post LWR and CRD.

Is that your recollection of that information?

MS. SCHNEIDER-VIEIRA: You know, it's certainly true for the First Nation information. I would have to double check on the information,

in terms of the technical information. I suspect we can't say for sure just because the sampling of chlorophyll and phytoplankton was not done prior, extensively prior to CRD and LWR.

MS. LAND: Okay. I can take you to the specific page, it is section 4.2.3.1 of the volume and it's page 4-6.

MS. SCHNEIDER-VIEIRA: Are you in the aquatics environment supporting volume?

MS. LAND: Yes, in the aquatic environment volume. And it said that western science assessment showed that there were more common occurrences of algae in Burntwood River, Split Lake, Clark Lake and Gull Lake post CRD and LWR. Is that correct?

MS. SCHNEIDER-VIEIRA: I'm just looking here.

MS. LAND: Sure.

MS. SCHNEIDER-VIEIRA: Sorry, you're on page 4-6?

MS. LAND: Yes.

MS. SCHNEIDER-VIEIRA: I'm still having difficulty finding your exact quote here.

MS. LAND: Okay.

MS. SCHNEIDER-VIEIRA: We have

overview and regional context correct, and the environmental setting has been described based on available background information. Is that the section you are in?

MS. LAND: Yeah. So it's the section Split and Clark lakes in the Nelson River system, and --

MS. SCHNEIDER-VIEIRA: I see, okay, I'm with you now.

MS. LAND: So 4-8, the first full paragraph, mean phytoplankton biomasses, Split Lake in 1987 to 1988 was 25 percent to 50 percent higher than reported in 1972 to '73.

MS. SCHNEIDER-VIEIRA: Yes, that is correct, but phytoplankton biomass is highly variable, so basically it's not sufficient data to say yes, absolutely, it's higher or it's lower as a result of CRD or LWR.

MS. LAND: But over time it is trending higher.

MS. SCHNEIDER-VIEIRA: Pardon me?

MS. LAND: Over time your science, the science basis is showing that for this particular purpose it's trending higher. It's comparing what was happening in 1987 to 1988 and saying you have

25 to 50 percent higher phytoplankton biomass in Split Lake.

MS. SCHNEIDER-VIEIRA: Yes. And those are two years pre data and two years post data. And when you look at longer term records of phytoplankton, you'll see it's quite variable amongst years. So, for example, what was happening in '87, '88, could have been related to those specific growing conditions. Phytoplankton is notorious for having blooms that occur. Some years have blooms, some years don't, as those of us who have been observing Lake Winnipeg have observed. So to come up with a definite conclusion of saying, yes, the amount of algae after hydroelectric development is higher and that it's due to the hydroelectric development, you would need a longer term data set.

MS. LAND: Right. I guess the question I'm a getting at is, I'm trying to understand which algae you turned your mind to. So why don't I go right to that particular issue then. Are you familiar with the report called restoring the health of Lake Winnipeg, which was a report of the Lake Winnipeg implementation committee?

MS. SCHNEIDER-VIEIRA: I have heard of the report, and I believe there's other people on my panel who are familiar with it.

MS. LAND: Okay. And I'd like to take you to a quote from that report at page 29, and I'll read it into the record for the purpose of the panel.

THE CHAIRMAN: Excuse me, is that to do with the Branson report?

MS. LAND: Yes.

THE CHAIRMAN: Thank you.

MS. LAND: So this is actually the technical annex to the report. And on page 29 it says:

"Algal toxins are of a significant concern around Lake Winnipeg, as well as downstream in the major Nelson River to communities using the river and the lake as a source of drinking and domestic water. The outflow from the north basin, subject to the largest blooms of blue-green algae, is at risk of containing algal toxins. Reservoirs downstream on the Nelson are expected to contain toxic algae

and toxins due to the presence of blooms. A very large bloom of microcystis occurred at Cross Lake on the Nelson in the late 1980s following the establishment of the reservoir at that community. Monitoring for these toxins is not yet taking place at these communities."

So this report, among other things, identified a concern about the development of blue-green algae blooms on Lake Winnipeg, including the toxicity of that and the impacts downstream.

My question for you is, when I was looking at the information about how you cumulatively assessed the impacts of the project, and what the inputs were, whether there was anything about the risks of the migration of this toxic algae from the Lake Winnipeg area into the system? Elsewhere in this report it identifies that at particular risk are reservoirs downstream, which are potential catchment areas for the migration of this microcystis.

So my question is, is there monitoring plans for the reservoir in the study area to

monitor for the algae, toxic algae bloom microcystis coming from the Lake Winnipeg area?

MS. SCHNEIDER-VIEIRA: There is, as you already heard about, the CAMP program, the Coordinated Aquatic Monitoring Program, and that is much more of a regional monitoring program. And under that program, when microcystis is measured, when the chlorophyll A biomass is greater than ten micrograms per litre. So that regional program is indeed sampling down the river, depending on what algal biomass is measured.

MS. LAND: Okay. I didn't see evidence of that in the supporting volumes, so perhaps I missed that.

So maybe you could give -- in terms of specifically monitoring for microcystis in the reservoir area, maybe you could give me an undertaking to provide me with information about where specifically that can be found?

MS. SCHNEIDER-VIEIRA: The monitoring for microcystin is happening underneath the CAMP program, and that wasn't planned for the Keeyask program. Basically, the CAMP monitoring occurs over a much larger area. If, in its review of the

aquatics effects monitoring plan, the Provincial Government decides that they want to have microcystin monitoring in the reservoir, I'm sure that they would add that.

I should note, though, that based on the analysis that we have done on the predicted water turbidities, and also conditions in the reservoir, we're not expecting to see large blue-green algal blooms. And are these blue green algae that can create the toxin that we're concerned with here.

MS. LAND: So just to clarify, ultimately your answer is that, no, there is not specific monitoring for this in the future monitoring plan right now?

MS. SCHNEIDER-VIEIRA: There isn't, for the Keeyask Generation project there is not specific monitoring for this, because it has not been identified as a concern in terms of the predicted affects to algae. We expect that when the Province reviews it, they may add it. They have in other monitoring plans. However, it is monitored as part of the coordinated aquatic monitoring program which has been conducted both upstream and downstream.

MR. DAVIES: Just to remind you, the list I read rather quickly in regard to CAMP, Split Lake, Assean Lake, Assean Lake is very close to Split Lake, Stephens Lake north arm and Stephens Lake south are all monitored under the coordinated aquatic monitoring program and microcystin is included under that program.

MS. LAND: When was that -- can you remind me when that program was set up? Was that fairly recently?

MR. DAVIES: The MOU was started in 2006 and the program was implemented in 2008.

MS. LAND: Can I take you to slide 45, sir -- page 45 of your presentation? So page 45 is slide number 13 of the presentation on aquatic and terrestrial environment. It's the slide on water quality, historic conditions.

MS. SCHNEIDER-VIEIRA: All right. I have it.

MS. LAND: So I noted when you were going over the information in this slide, you spoke orally of the technical conclusions that there was not data showing the effects of CRD, LWR and Kettle on historic water quality conditions. You didn't mention, I skipped over it when you

were speaking orally about this slide, the information that was bulleted there about First Nations reporting that water is murky and of poor quality post hydro development. So this would be an example of a difference in view between what your technical reviews, science reviews showed about the historic conditions with respect to water quality versus the knowledge that was coming forward from the Cree Partners' knowledge base. Would that be fair to say?

MS. SCHNEIDER-VIEIRA: I would say it is true in part. In terms of the technical analysis, the ability to -- the point that I was trying to make is that because the data -- first of all, there is no data pre Kelsey so we can't do a technical analysis on the effects of Kelsey on water quality. Prior to the CRD and LWR, there were only two years of sampling conducted. So that is quite a limited database for assessing changes to water quality.

As we were just discussing with algae, and as I noted also with turbidity, it varies quite a lot both within a year and between years. And so if you want to detect small changes, you need a much longer database. However, it is

sufficient to detect very large magnitude changes. But you were correct also in that the First Nations generally report greater effects to water quality than are apparent from the technical analyses.

MS. LAND: And again on page 55 of the handout, which is slide 23, again you point out where there's a difference between, in terms of the information about fish health and data, differences between what the First Nations were saying, which was that Kettle and other developments caused changes in species and abundance, and that the fish are in poor condition, which was different than what the technical studies were showing, which was it was difficult to make comparisons, and that you were concluding that the composition and abundance historically have remained similar.

So would it be fair to say that this and other examples in your presentation point to numerous situations where there were differences in the western science and the KCN traditional knowledge base about the evidence of historic impacts on water quality and on fish as a result of the existing Hydro projects?

MS. SCHNEIDER-VIEIRA: Yeah, I would say that there are certainly differences. I think the thing is, what's important to note is also the degree of difference. So where we would say, well, maybe there was a shift, we're not sure, and the First Nations would have said, oh, yes, definitely that's what we saw. So they are not -- I was going to say it's not -- there's overlap amongst them, but there's differences in the degree of certainty with respect to the change.

MR. DAVIES: There is also some things that we can't explain to you, that due to science we have fish that are in poor condition, not good to eat, we have had fish tested at a number of locations by the Department of Fisheries and Oceans in terms of quality, and they pass all of the tests in terms of quality, both in terms of contents of metals, but also in terms of taste, smell and texture. Yet it's universal among the First Nations that they feel that the quality of the fish has deteriorated. It's not just one First Nation, it's all of the First Nations that have been affected.

MS. LAND: Right. Isn't it also the case that, in fact, that there are advisories from

the Manitoba Government about safe levels of consumptions of various fishes, of fish in the water areas that the Partner First Nations are using?

MR. DAVIES: There are consumption advisories where areas of mercury had been elevated. I guess there's a few things to remember. Mercury has decreased in almost all of the locations to background levels. There are some notifications on the amount of fish that should be eaten, particularly by women of child bearing age.

The other thing was that the report that the fish are not good to eat isn't related to mercury levels, it's related to taste and texture. The people feel that they are softer and don't have the same taste. And more recently there has been a change in fish condition in regards to the consumption of smelt. The smelt has an enzyme that are actually burning the bellies of the walleye, it is called belly burn, and changing the colour and composition of the fish.

MS. LAND: So in those situations where you have some differences between the western science technical data and the viewpoint

of First Nations about the historical and ongoing quality of water and quality of fish, is it fair to say that the response then is that you are proposing to monitor for harm and take future adaptive measurements, if necessary, as opposed to any immediate mitigation measures?

MS. SCHNEIDER-VIEIRA: I think there's almost two parts to that answer. First of all, as I'm sure you have reviewed, the First Nations have done their own community reports and there they describe what they feel the project will do, and what they have done as communities to address the effects of the project. And for example, for some of the communities they have elected to find other places to eat fish, to get fish.

In terms of the effects of the Keeyask project, yes, where there is disagreement we have agreed to monitor. Sometimes also where there's disagreement, we have adopted additional measures so that there is -- I was going to say there is greater certainty. So for the first instance, for example, based on the hydraulic modeling done by the engineers, they feel quite confident that there will not be effects to open water levels in Split Lake. And I think you have already heard

that. And so by linkage then, we would say there is not going to be any effects to water quality or whatever in Split Lake. However, the First Nations are not comfortable with that conclusion. So our monitoring program does make provision, for example, to continue to sample water quality in Split Lake, even if we think that there are not going to be any changes there. So that's the first example.

And then the second one is where the First Nations are not comfortable with some of the mitigation measures, we have basically found additional ones. For lake sturgeon, we are quite confident that the spawning structure will work as it has elsewhere. The First Nations are concerned, as they should be, and so we have sort of a back-up plan of having a spawning program to support the populations in Stephens Lake until such time as we can get the spawning structure to work.

MS. LAND: Would you consider that approach that you're taking then to be an example of adaptive management, where you are monitoring for effects and then responding to them as you learn about the effects over time? Because if I

understand correctly what you're saying, you're saying you are going to -- you have a difference of opinion about whether there will be effects or not on water quality and on fish. The Cree First Nations say they think there's going to be, based on their experience, the technical science is saying no, probably not. So the response is no immediate mitigation, we're going to monitor to see what happens and then respond later, when and if necessary. Is that correct?

MR. DAVIES: I think what we're saying is that whenever there's uncertainty, and uncertainty is created between difference of opinion between ATK and science, that we are going to monitor. And if there is an effect, we'll determine what that effect is and apply the appropriate mitigation for it.

MS. LAND: How does that fit in with the concept of the precautionary principle, or the concept that if you have good adaptive management that you are not just monitoring to learn, but you are making sure that you have processes planned and in place up front to mitigate?

MS. SCHNEIDER-VIEIRA: Okay. I think the easiest way is to provide an actual example.

And we're going to deal with one of the areas where we have the greatest uncertainty, which is with respect to the young-of-the-year sturgeon habitat in the reservoir. As I said, overall, there is a higher degree of uncertainty for this life stage than for others for lake sturgeon, because it's just not a life stage that is well understood. It is not a fish, even when you speak with the First Nations, they don't often see sturgeon, or very rarely see sturgeon that is that small, because they are living in the bottom of the river. So what we have done then is we have done an analysis, we have come up with some predictions, because we don't want to just willy-nilly go out and start putting sand in the river, which is quite an undertaking in itself. We have identified ways to monitor, to see whether or not the sturgeon are recruited to the area where we think they may. In addition, the engineering team has done some very detailed analysis, which is actually described in one of the IRs for DFO, where they have actually gone so far as to identify sources of sand. They have identified barges. They have identified ways of putting the sand on the bottom of the river if you

need it. So it isn't just, yeah, we'll come up with a solution if we need to. It is actually something that has been developed.

Then the final part of that then is we have a back-up safety plan, which is because we know this will take a number of years, we are also stocking young sturgeon into the river. And we know from other areas within northern Manitoba, as Shelley described from the upper Nelson River, that when you stock young sturgeon, we have very good information that those do survive. So it's almost a three part plan. For that reason we feel that it is a good example of the precautionary principle.

MS. LAND: Okay. Let's use that example and tease that out a bit.

So in terms of the young-of-the-year sturgeon, if I understood your evidence correctly, when you were going through the information that you had about the sampling, the only area -- and you talked about how difficult it was to -- not just for you but for other people who had done the testing on young-of-the-year sturgeon to actually find them. And you mentioned that the only location where indeed you succeeded in finding

them was in the upper reach of Gull Lake. Is that correct?

MS. SCHNEIDER-VIEIRA: Yes. And I believe, and my back row will tell me, I believe there is also some very young sturgeon that we found in a couple places in Stephens Lake. They have also actually been found quite extensively in the Winnipeg River through some of the research that has been done there.

MS. LAND: But in terms of the project area itself, my understanding is when you walked through and you showed where the sampling had occurred, and where you had actually found the young-of-the-year, that the only location you had found them was in the upper reach of Gull Lake?

MS. SCHNEIDER-VIEIRA: Yeah. And they are also, you may recall I showed you some in that patch downstream in Stephens. Remember I pointed out the habitat, there's a little blob in Stephens Lake downstream of Gull, also there.

MS. LAND: Okay. So my understanding, though, is based -- I can't remember if it was based on the sample size that you were using, but my understanding was that you were saying that the area where you expected that they were most

predominant, based on what you understood from that sampling, was in that area of upper Gull Lake; is that correct?

MS. SCHNEIDER-VIEIRA: Yes, that is correct.

MS. LAND: And that's an area that you anticipate will be destroyed by the project?

MS. SCHNEIDER-VIEIRA: Yes, we anticipate that it will no longer be suitable for young-of-the-year.

MS. LAND: And so you're proposing to create new habitat based on the experience that Hydro Quebec has used in Quebec?

MS. SCHNEIDER-VIEIRA: No, Hydro Quebec has created spawning habitat. I indicated that this is the first -- would be the first attempt to create young-of-the-year habitat.

MS. LAND: Right. So Manitoba Hydro, in its previous projects, has never successfully created young-of-the-year habitat before for lake sturgeon?

MS. SCHNEIDER-VIEIRA: Yeah. In fact, to be fair, 2008 was the first time that we actually found young-of-the-year sturgeon, and it's the first time anyone has found

young-of-the-year sturgeon in a large river system.

MS. LAND: Okay. Similarly in terms of -- just because you mentioned spawning habitat, when you were mentioning the sample sizes of mature fish that were using spawning areas, the largest proportion of fish using spawning areas was in the Gull Rapids. Is that correct?

MS. SCHNEIDER-VIEIRA: No, there are very, very few fish in Stephens Lake. And we have not actually found spawning sturgeon in Stephens Lake, like fish that were actually in spawning condition since the early 2000s. In the Keeyask area where we find spawning sturgeon are in the vicinity of Birthday Rapids.

MS. LAND: Okay. So, actually what I was looking at was, we are on page 93, slide 61, was where the estimated number of mature sturgeon are. So the largest number appeared to be -- this was a slide on population trends. The estimated number of mature sturgeon, Birthday to Gull Rapids, 643, which is a larger number than in the upper Split Lake area, and then the two few captured in Stephens Lake. So the largest number of mature sturgeon that you were finding was in

that stretch from Birthday to Gull Rapids?

MS. SCHNEIDER-VIEIRA: That's true, and those are the fish that are spawning at Birthday Rapids or Long Rapids.

MS. LAND: Okay. And they are actually currently spawning at Gull Rapids, is that not the case?

MS. SCHNEIDER-VIEIRA: No, the Stephens Lake fish are moving up to Gull Rapids, the fish in Gull Lake are moving further upstream to Birthday and Long.

MS. LAND: So Gull Rapids, they are not being used at all for spawning?

MS. SCHNEIDER-VIEIRA: They are not being used by fish from Gull Lake. They are enormous rapids, there might be a sturgeon from Stephens Lake that had slipped into the rapids to spawn that we didn't find. And I believe historically they also -- we did in the early 2000s find some fish that were maturing to spawn downstream of the rapids. That's subject to check.

MS. LAND: Right. And so just to pick up on what you were saying before, in terms of experience and actually creating habitat, has

Manitoba Hydro ever successfully created new spawning habitat for lake sturgeon in the Manitoba Hydro hydraulic system before?

MS. SCHNEIDER-VIEIRA: Manitoba Hydro has tested the creation of spawning habitat. Downstream of the Pointe Du Bois Generating Station, there are a large number of sturgeon downstream of Pointe Du Bois. So at least there are sturgeon that could respond to the habitat that you put into that area.

The results of that work was in one of the IRs, which I'm hoping that somebody is going to give me the number for, and then we can go to that and look. The results of that work were mixed. The Pointe Du Bois station is very old, and so some of the spawning shoals were basically created in front of generating units that then were turned off for the subsequent year, so we couldn't get good data. There are some of the shoals where we did find evidence of sturgeon spawning.

MS. LAND: Is it fair to say that generally the approach then is, there's a recognition that there would be -- there's a significant amount of spawning habitat that will

be destroyed in the study area, that you are anticipating then replacing with the creation of new habitat?

MS. SCHNEIDER-VIEIRA: Yeah. Now, just to follow up on my last comment. The IR that's in question is DFO 0045, if you're interested. That was basically, I believe it was in the round two TAC, and that describes the results of that work. And then in terms of the spawning habitat at Gull Rapids, whatever existing habitats that's there will be lost. And yes, we are anticipating replacing it through the creation of the spawning structure, or replacing the function, I should say. We're not looking at replacing whatever total area there may be. What we have done is an analysis that says we believe that something like 3 hectares will be sufficient to support a good sturgeon population in Stephens Lake.

MS. LAND: And elsewhere where you talked about the mitigation measure for using stocking in order to deal with the loss of fish population due to the operation of the turbines and so on, you said that the proposed mitigation measure was to stock. And I'm going to actually

take you to that slide, it's page 98 of the handout, which is slide number 66, which is the slide on recovery and mitigation methods used elsewhere.

And you were talking about stocking and translocation, and you said this is effective where habitat is available.

So would you agree that the stocking success is going to depend in part on whether you have successfully created new habitat for the lake sturgeon to replace the habitat that's been destroyed by the construction and operation of the project?

MS. SCHNEIDER-VIEIRA: If the objective of the overall mitigation program and the stocking program specifically is to create a long term self-sustaining population, and that means it's a population that doesn't require stocking forever to maintain it. And in order to have that, you do need habitat to support all life history stages, including spawning habitat.

So you are correct that we need to have spawning habitat in Stephens Lake if we want to have a self-sustaining population there.

MS. LAND: So if the habitat creation

programs are not successful, that would ultimately also affect the success of your proposed mitigation measure of stocking?

MS. SCHNEIDER-VIEIRA: No. If the habitat creation is not successful, you could continue to stock in perpetuity and have sturgeon there. It's simply that it would not be a self-sustaining population. It would require stocking to maintain it.

MS. LAND: You mentioned elsewhere that you come to the conclusion that no fish passage is required for walleye, lake whitefish and northern pike. Is that correct?

MS. SCHNEIDER-VIEIRA: Yes, it is the conclusion of the partnership that fish passage, upstream fish passage for this species is not required to maintain the populations. However, I should note, though, my discussion about DFO and their requirements for fish passage focused on lake sturgeon. They would also be looking at these other species.

MS. LAND: Did the Cree Partners in the project agree with your conclusion that no fish passage is required for these species?

MS. SCHNEIDER-VIEIRA: As I mentioned,

we had two workshops, as well as many, many meetings of the aquatic working group on this topic. And there was, I was going to say there was no clear consensus. Many of the Cree people were very interested in maintaining connections amongst the natural areas. But when we got to the point of saying, are you willing to do a measure which might cost -- which would cost tens of millions of dollars, is that the smartest way to attempt to mitigate the effects of the project? And then when they looked to us and said, well, will it increase the number of fish, and we said, well, we don't have any evidence that it will increase the number of fish, it just didn't seem, I believe for the group as a whole, as a way to go. However, I know that you'll still find individuals who are very interested in fish passage.

MS. LAND: But in the end, you have ultimately concluded that there's no clear benefit for fish passage either for lake sturgeon or for the other fish species, is that correct?

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

MS. LAND: And so your response is to

just continue to monitor, investigate further to see if there's a better approach or alternative to fish passage? Is that my understanding, your response is to monitor to see what you might be able to do in the future?

MS. SCHNEIDER-VIEIRA: The Department of Fisheries and Oceans, or Fisheries and Oceans in Canada, as they are known now, are very interested in fish passage. And they have concluded, different from the conclusion of the partnership, that they don't see definite evidence that you either need or do not need fish passage. And so they have agreed to the approach of monitoring post-project to see -- first of all, if the partnership's conclusions are correct, and also of doing monitoring that would support the development of an effective fish passage system, because the other part of the fish passage discussion is that, even if we decided to do that, yes, you need upstream fish passage, we don't have information on how the fish will respond to the environment to design a fish passage system that would necessarily be effective.

MS. LAND: So it's essentially, we'll wait and see what happens, what makes sense then

to deal with the issue of fish passage? There's no concrete proposal in place as an alternative to fish passage?

MS. SCHNEIDER-VIEIRA: The concrete proposal that is in place as an alternative to fish passage is the mitigation package that has been developed for the project. And that is basically looking at providing all habitat to support all life history stages upstream and downstream.

The typical place where you need fish passage is where fish need to move up past an area to access critical habitat, such as spawning habitat. In this case, we were providing spawning habitat, rearing habitat, overwintering habitat, feeding habitat. All those habitats will exist both upstream and downstream of the station.

MS. LAND: Those are all my questions.

THE CHAIRMAN: Thank you, Ms. Land.

Perhaps we should take a break and come back in 15 minutes, Mr. Williams, and you can start then. So come back at ten after 3:00, please?

(Proceedings recessed at 2:54 p.m. and reconvened at 3:10 p.m.)

THE CHAIRMAN: Can we reconvene, please.

Mr. Williams, over to you.

MR. WILLIAMS: Yes, good afternoon members of the panel and good afternoon members of the Hydro panel and the extensive back row as well.

Mr. Chair, to you, there should be two exhibits that we propose to present today with what I understand to be the kind consent of my learned friend, Mr. Bedford. One is an article, Home Range Size and Seasonal Movement of Juvenile Lake Sturgeon in a Large River in the Hudson Bay Drainage Basin. And if that's not a show stopper of an article, I don't know what is.

And the other one is only an excerpt from a document entitled Recovery Potential Assessment of Lake Sturgeon Nelson River Populations which is by the Canadian Science Advisory Secretariat. I won't be referring to them right away but at some point in time, I'll bring it to the panel's attention.

Now most of my questions this afternoon are going to be on lake sturgeon. And mostly, they will be directed to

Dr. Schneider-Vieira who has kindly given me permission to call her Dr. Schneider for the rest of the afternoon.

Ms. Matkowski, if you feel the interest or wish you chip in, you are of course more than welcome.

I actually do know my slide number today as compared to last week. In a few moments, we will be coming to slide 54, which is page 96. We're not quite there yet though, Dr. Schneider.

MS. SCHNEIDER-VIEIRA: I'm prepping.

MR. WILLIAMS: But in the course of your extensive work on lake sturgeon, you have had opportunity to review a number of the federal documents including the recovery potential assessment of lake sturgeon from 2010. Agreed?

MS. SCHNEIDER-VIEIRA: I have reviewed it but Shelley Matkowski will be taking the questions on the RPA.

MR. WILLIAMS: Super. And either to you or Ms. Matkowski, you would also be familiar with some of the work that the Province of Ontario is doing in terms of the lake sturgeon issue such as their review of lake sturgeon stocking in North America from 2009? Would that have been something

the Hydro panel would have reviewed in preparing their work for the EIS?

MS. SCHNEIDER-VIEIRA: Yes, I believe we have.

MR. WILLIAMS: And you also, although you may not have it memorized, your panel would be familiar with also the 2011 study from Ontario titled A Review of Lake Sturgeon Habitat Requirements and Strategies to Protect and Enhance Sturgeon Habitat? Would that be a document the Hydro panel is familiar with?

MS. SCHNEIDER-VIEIRA: Yes.

MR. WILLIAMS: Now, Dr. Schneider, turning to slide 64. The corporation sets out what it considers the various life history stages of sturgeon on that page. Agreed?

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

MR. WILLIAMS: And just for the purposes of definition, just so we're on the same page, are we in agreement that Young of the Year or YOY, are juveniles in the first year of their lives?

MS. SCHNEIDER-VIEIRA: Yes.

MR. WILLIAMS: And below Young of the

Year, we see another term called juvenile. And am I correct in suggesting to you that the term juvenile is generally used to describe a young sturgeon that has not reached sexual maturity?

MS. SCHNEIDER-VIEIRA: Yes, that's true. And sorry, they change a lot in what they are doing. So we always say juvenile/sub adult. A two year old sturgeon and an 18 year old sturgeon are somewhat different.

MR. WILLIAMS: And we're just going to come to that. Would I be correct in suggesting to you that sub adults are juveniles that have moved away from home in that they have abandoned their juvenile nursery habitat? That's generally the definition that we use for sub adults?

MS. SCHNEIDER-VIEIRA: Not really. We found some older sturgeon that are still living, I was going to say still living at home if you will. In Gull Lake, there are certain aggregations where we wondered whether in the years that they were young sturgeon, whether they had actually settled there.

MR. WILLIAMS: So there is a bit of confusion with the term. Sub adults would still be sexually immature. Is that your understanding?

MS. SCHNEIDER-VIEIRA: Yes, that is true.

MR. WILLIAMS: You use it as a shorthand way to differentiate between the wild two year old and the still sexually immature but older 18 year old?

MS. SCHNEIDER-VIEIRA: Well, actually in the EIS, we went with Young of the Year and we lumped everything up from two to 18 in one category with text describing that. Yes, it does cover a range.

MR. WILLIAMS: And when we look at the development of effective management and conservation strategies for lake sturgeons, we can agree that effective strategies rely upon an understanding of the processes that influence each life history stage for lake sturgeon. Agreed?

MS. SCHNEIDER-VIEIRA: Yes, that's true. And when we look at the data and the scientific research into lake sturgeon, can we agree that lake sturgeon are not homogenous in that there are differences in behaviour, habitat use and movement between distinct genetic groups? My specialist says yes, so I will say yes.

MR. WILLIAMS: And that's one of the

reasons of course we want to study lake sturgeon across a variety of environments and across a variety of latitudes because their behaviour may be somewhat different depending upon their environment, their genetic disposition and the latitude in which they live. Agreed?

MS. SCHNEIDER-VIEIRA: Well, I would say that for academics and research, and myself as a biologist, those are very interesting questions. The Keeyask project, what's important is that we understand what is happening with the sturgeon in the Keeyask area. Obviously those are the ones that we're impacting, and we draw information from many other systems. And it is true, it is important for us to understand why -- you know, if those other systems might be in some way different from the Keeyask system.

MR. WILLIAMS: So I believe we are in agreement in that when we look at information from other systems, we should examine that information with care in order to be aware of the similarities but also the differences. Agreed?

MS. SCHNEIDER-VIEIRA: Yes, we would agree with that.

MR. WILLIAMS: And of course when we

look at your cornerstone stocking program, it would be fair to say that you have drawn from a variety of sources including research from the United States. Agreed?

MS. SCHNEIDER-VIEIRA: Yeah, we have drawn from sources in Manitoba. We have drawn from sources, as I say Winnipeg River, upper Nelson River, Assiniboine River, we have drawn from sources like in the Rainy River, the upper parts of the Red River drainage in Minnesota. And we have also drawn from research in the United States, in particular work that's been done along the Great Lakes.

MR. WILLIAMS: As well as on the St. Louis River, agreed?

MS. SCHNEIDER-VIEIRA: Yeah.

MR. WILLIAMS: And likewise, when you look at information relating to hatcheries, you rely upon a number of American sources including the Wild Rose Hatchery in Wisconsin. Agreed?

MS. MATKOWSKI: Agreed.

MR. WILLIAMS: And, Dr. Schneider, just to underscore the importance of looking at context, we can agree that lake sturgeon growth has been found to differ considerably across their

range, a fact which has been attributed to latitudinal variation. Agreed?

MS. SCHNEIDER-VIEIRA: Well, it is true that different areas have different amounts of sturgeon growth. However, it's a complex situation. For example, we have found that some of the sturgeon growing in the Keeyask area actually are growing quite quickly.

MR. WILLIAMS: You would not disagree with me if I suggested that generally, the scientific literature suggests that the growth of lake sturgeon decreases with decreasing mean air temperatures and increasing latitude. Agreed?

MS. SCHNEIDER-VIEIRA: I believe that is the case in the scientific literature. However we see that very young sturgeon in Keeyask are growing faster than the ones at point, in terms of the length of age relationship.

MR. WILLIAMS: And certainly your work on the Winnipeg River system has suggested to you that sturgeon from the Winnipeg River are growing more slowly than more southern sturgeon. Agreed?

MS. SCHNEIDER-VIEIRA: Let me just consult with those who have actually done work on the Winnipeg.

MR. WILLIAMS: Henderson would be one of the sources for that if you're looking.

MS. SCHNEIDER-VIEIRA: Apparently the growth of young sturgeon is a little bit more complex than just related to temperature. Certainly in research work that's been done in the Winnipeg River with one reservoir, there has been a large range in growth rates of young sturgeon, different places within the same reservoir.

MR. WILLIAMS: Okay. It would be fair, and we would be in agreement, that very little is known about the early life history of lake sturgeon, especially in large impounded systems, like the Nelson or Winnipeg River, agreed?

MS. SCHNEIDER-VIEIRA: As I mentioned in my presentation, work on Young of the Year sturgeon is the area of active research on lake sturgeon at present. And certainly here in Manitoba since 2006, due to research work done on the Winnipeg River as well as on the Nelson River, the amount of information -- the amount that we know about this life stage has increased tremendously. It is true that there's always more to learn.

MR. WILLIAMS: Let me go further than that though, Dr. Schneider. The reason there's been this blossoming of research is because within the scientific literature, we know very little about the early life history of lake sturgeons especially in large impounded systems like the Nelson and Winnipeg River.

MS. SCHNEIDER-VIEIRA: That has certainly been an area of very active research as you said. Dr. Barth here behind me actually did his Ph.D. on life stages as you are likely aware. And it is the one where we have been focusing on doing or Manitoba Hydro has funded a tremendous amount of work to work at filling the information gaps on that life stage.

MR. WILLIAMS: And in fact, within the scientific literature, words were used such as knowledge gaps in terms of knowledge relating to the early life history of lake sturgeon in large impounded systems, agreed?

MS. SCHNEIDER-VIEIRA: Yes, that's true. And that work is addressing those gaps.

MR. WILLIAMS: And it would be fair to say that data on the habitat preference growth and survival of Young of the Year lake sturgeon in

large rivers is virtually non-existent in the scientific literature. Agreed?

MS. SCHNEIDER-VIEIRA: We're going to continue to split hairs here. We know where they were spawned. The stage from where they drift from that spawning location to where they settle is not well understood. We don't know where they are. That is a poorly understood life history stage. Once they have settled and we can find them and we can sort of record their growths over the winter and look further again the subsequent year, there is more information available on that. So it's sort of a fine line.

MR. WILLIAMS: And as I understand the fine line you have drawn, there is a particular shortage of information or a knowledge gap in terms of larval drift. Agreed?

MS. SCHNEIDER-VIEIRA: Larval drift and where they initially settle, yes.

MR. WILLIAMS: And then accepting your point about spawning but moving now to your part 3 of your answer regarding habitat of Young of the Year, would it be fair to say that there have been a very limited number of studies in terms of the seasonal movement patterns, spatial requirements

and home range size of the juvenile life history stage of lake sturgeon in large riverine environments?

MS. SCHNEIDER-VIEIRA: There was one study that was in part of your exhibit which is the work done in Winnipeg River. We also have some understanding of where we can find Young of the Year as well as year old sturgeon in the Nelson from the work that we have done. But certainly there aren't enough young sturgeon there to do the kinds of extensive work that's been done in the Winnipeg system, that's true.

MR. WILLIAMS: Thank you for that. And of course just turning to the home range size and seasonal movements of juvenile lake sturgeon, an article, I have to tell Dr. Barth, has kept me riveted for many hours. Dr. Schneider, I take it you have been similarly enthralled?

MS. SCHNEIDER-VIEIRA: Absolutely.

MR. WILLIAMS: Yes. Who wouldn't be.

At page 1630 of Dr. Barth et al's article. And just towards, Dr. Schneider, hopefully there's a marked line toward the bottom of the left-hand side of that column. And you will see Dr. Barth agreeing with you and I that

there is still more work to be done in terms of our understanding of the seasonal movement patterns, spatial requirements and home range size of the juvenile life history stage of lake sturgeon. Agreed?

MS. SCHNEIDER-VIEIRA: Yes.

MR. WILLIAMS: And we won't spend a lot of time on this study but if I can take you to page 1640. And, Dr. Schneider, I'm directing you towards page 1640, the left-hand column, hopefully the second last pen mark on the left-hand side. One of the important insights was that in large rivers, lake sturgeon exhibit high year-round site fidelity and rarely move through rapids. Agreed?

MS. SCHNEIDER-VIEIRA: Yes.

MR. WILLIAMS: And so if you will recall, this was in an area where there was roughly a 49 kilometre stretch of habitat that was being examined. Agreed?

MS. SCHNEIDER-VIEIRA: Yes.

MR. WILLIAMS: And so despite the potential for movement over that 49 kilometres of naturally connected riverine habitat, the results from this study indicated that juvenile lake sturgeon exhibited strong site fidelity. Agreed?

MS. SCHNEIDER-VIEIRA: Yes. And I believe there is also a caveat in that this is an area where there was discontinuous deep water habitat. So basically it's almost like a bowl. So the sturgeon did not move up into the shallower areas. So they were left, if you will, in the bottom of this bowl.

MR. WILLIAMS: Although it's not unusual to find lake sturgeon, juvenile lake sturgeon in those deeper waters. Agreed, Dr. Schneider?

MS. SCHNEIDER-VIEIRA: Yes, that is the case. We haven't observed them moving downstream or upstream over rapids very much once they have settled to the bottom.

MR. WILLIAMS: And you would also agree that we don't often see them in very shallow water even apart from rapids, agreed?

MS. SCHNEIDER-VIEIRA: Yes, in this system.

MR. WILLIAMS: And just staying with page 1340 for a second, excuse me, page 1640, I apologize, to the bottom left again, the last pen mark. And one of the -- it should be on the same page, Dr. Schneider. One of the hypotheses that

flows out of Dr. Barth et al's work is the possibility that suitable areas of juvenile lake sturgeon habitat could exist but might be under-exploited in part due to their high site fidelity. Agreed?

MS. SCHNEIDER-VIEIRA: Yes. The way, essentially as I described to you earlier, the sturgeon hatch and they drift down the river. And where they settle basically then is where they stay at least for some time.

MR. WILLIAMS: And one of the phenomena that has been observed is even if there might be what appears to be suitable habitat in other locations, they tend not to go there. Agreed?

MS. SCHNEIDER-VIEIRA: Certainly when you look further downstream. I want to emphasize the importance of the drifting from the spawning area and the settling. So yeah, if you're looking at areas further downstream, certainly they don't seem to be then picking up and swimming further downstream.

One thing that we do want to note though is in the Winnipeg River where this work was done, as I said, there was some deep bowls.

In the Nelson River, it is interesting to see how they distribute themselves because the deep water habitat tends to be more continuous.

MR. WILLIAMS: And we wouldn't have a peer-reviewed study like Dr. Barth's for the Nelson River river system though, would we?

MS. SCHNEIDER-VIEIRA: No, we don't.

MR. WILLIAMS: Dr. Schneider, can we agree that the life history of lake sturgeon makes a comprehensive assessment of stocking programs difficult in that assessment of stocking programs requires a minimum of 15 to 20 years, i.e. of lake sturgeon generation for comprehensive program results?

MS. SCHNEIDER-VIEIRA: You are correct in that we have not, in Manitoba, documented -- well, I'll back up. The first and most important or the first measure that people use for the success of a stocking program is whether the fish placed in the environment survive and whether they basically stay close to or in some area where you can find them again and grow.

In Manitoba, including in the upper Nelson River, it's been demonstrated that they both survive and grow.

As you alluded to in your 20 to 25 year duration of the program, what we have not yet demonstrated in Manitoba is that these stock sturgeon go somewhere to spawn. You're correct in that. Successful spawning has not been documented in many sturgeon stocking programs simply because it does take them 25 years. As you may well be aware, in the St. Louis River, they have documented successful spawning.

MR. WILLIAMS: And that would be Dr. Sharam's report on the St. Louis river system, agreed, subject to check?

MS. SCHNEIDER-VIEIRA: Yeah, agreed, subject to check. No, sorry, Cam says no. We have received some reports I believe from it was at a conference basically that they announced this.

MR. WILLIAMS: Okay. To you and to Cam, we can agree that there has been a comprehensive study on the St. Louis river system, agreed?

MS. SCHNEIDER-VIEIRA: You know, I would have to check. I'm not sure.

MR. WILLIAMS: Okay.

MS. SCHNEIDER-VIEIRA: It was noted

that Ron Bruch is the individual who announced the spawning in 2011 at a conference.

MR. WILLIAMS: Okay. Can we also agree that also the work of Rhodes et al on the Missouri and Mississippi Rivers would be an example of another comprehensive study? Drauch and Rhodes. Dr. Schneider, we can --

MS. SCHNEIDER-VIEIRA: Sorry, I just wanted to clarify. Certainly Dr. Barth is aware of the work. It did not closely inform the work that we did on Keeyask.

MR. WILLIAMS: I guess my question, Dr. Schneider, apart from the work on the St. Louis river system or the Missouri and Mississippi system, can you point my client or my expert to any other comprehensive study of lake sturgeon stocking?

MS. SCHNEIDER-VIEIRA: In terms of the initial --

MR. WILLIAMS: I may have been imprecise. By comprehensive, I mean the assessment of stocking programs over lake sturgeon generation.

MS. SCHNEIDER-VIEIRA: Not that we are aware of.

MR. WILLIAMS: Okay.

MS. SCHNEIDER-VIEIRA: I just wanted to clarify. I understood you to mean you were looking for stocking programs that had been monitored such that spawning by stocked fish has been demonstrated. Or are you interested also in stocking programs that have demonstrated survival and growth?

MR. WILLIAMS: I'm looking at those lifecycle ones through the 15 to 20 years.

MS. SCHNEIDER-VIEIRA: So that go up to spawning?

MR. WILLIAMS: Yes.

MS. SCHNEIDER-VIEIRA: I should note again that because most stocking programs, many are now reaching the 20 year mark. But the reason that there -- it hasn't been much information on whether or not stocked fish spawn is just simply the duration of those programs.

MR. WILLIAMS: Dr. Schneider, when we look at the survival of an aquatic species, would it be fair to say that the health of any species is associated with a general resistance to mortality and the availability of critical resources such as habitat and food?

MS. SCHNEIDER-VIEIRA: Yes.

MR. WILLIAMS: And speaking of lake sturgeon, we can agree that it is important for them to have a large and diverse ecosystem for each of their main life history stages?

MS. SCHNEIDER-VIEIRA: Lake sturgeon require a variety of habitats to fulfill all their life history requirements. As I noted in my presentation, that can require a large area or it can require a small area. And it depends on your local geography or geology.

MR. WILLIAMS: Fair enough. If we look to your life history stages put up on the slide being slide 64 at page 96, and I'm sure you have it memorized, Dr. Schneider, I don't think you need to turn there. But if we focused on that adult group for just one moment, we can agree that their habitat and food requirements are fairly general?

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

MR. WILLIAMS: And they are tough. They tend not to die easily once they reach that adult stage?

MS. SCHNEIDER-VIEIRA: That is true as

well.

MR. WILLIAMS: If we move down the chain a bit to the juvenile category, we can agree that like adults, they are not fragile.

MS. SCHNEIDER-VIEIRA: That's true.

MR. WILLIAMS: Can we also agree that as compared to older sturgeon, they appear to have much more specific habitat and food requirements?

MS. SCHNEIDER-VIEIRA: They do have more specific habitat requirements as they get smaller. And in fact, if you look at the habitat suitability indices that we developed for the Keeyask project, you'll see that it's illustrated quite clearly there.

MR. WILLIAMS: Okay. So I think we have agreed that compared to the adults, they do have -- they are somewhat more constrained in terms of specific habitat and food requirements?

MS. SCHNEIDER-VIEIRA: Yes.

MR. WILLIAMS: Now, let's focus on Young of the Year. In comparison to the two older groups, we can agree that they are relatively more fragile and more likely to suffer mortality?

MS. SCHNEIDER-VIEIRA: Yes, that's true, in terms of, for example, they would be more

vulnerable to predation let's say. I don't want to leave the impression that -- yeah, let's say predation.

MR. WILLIAMS: And as compared to the other two older groups, they also appear to require more specificity in terms of habitats and food?

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

MR. WILLIAMS: And if the proper habitat and food are not available, they will die?

MS. SCHNEIDER-VIEIRA: Certainly.

MR. WILLIAMS: And if we go right up to the top of that life history stage in terms of, I'm going to call it egg and yolk sack fry but we can include larvae in there, one vulnerability they do have is that they are vulnerable to predation?

MS. SCHNEIDER-VIEIRA: Yes. Once the eggs had been laid, they are vulnerable to predation.

MR. WILLIAMS: I guess another risk is whether the adult can find suitable spawning habitats. Agreed?

MS. SCHNEIDER-VIEIRA: Yes, that's

true.

MR. WILLIAMS: On the other hand, at that very young egg and yolk sack fry stage, there's no food required at that stage, is there?

MS. SCHNEIDER-VIEIRA: That's correct.

MR. WILLIAMS: Would it be fair to say that that period from egg to age one is the most vulnerable for lake sturgeon in terms of factors affecting survival?

MS. SCHNEIDER-VIEIRA: Yes.

MR. WILLIAMS: I'm not sure how much assistance it will be, but if you would like, we can turn to slide 78, which is page 110. Dr. Schneider, in terms of the mitigation strategy of Manitoba Hydro and its partners or the partnership, it would be fair to say that the cornerstone of the mitigation strategy is stocking?

MS. SCHNEIDER-VIEIRA: The stocking is a very important part of the mitigation strategy. But I should note, as I did during the presentation, that the intent is to have a long-term self-sustaining population. So it's not to have essentially a put take operation where they rely on stocking in perpetuity.

MR. WILLIAMS: Would I be correct in suggesting that when Manitoba Hydro is predicting increased regional abundance, you are not basing that prediction upon successful natural reproduction post Keeyask?

MS. SCHNEIDER-VIEIRA: The prediction of increased regional abundance is based on an increase, basically kick-starting the local populations such that you increase the number of sturgeon that are there at present via stocking. And then those sturgeon will mature over time and begin to reproduce on their own and form a self-sustaining population.

MS. MATKOWSKI: I might add that what we have seen in recent years at the stocking sites in the Keeyask area is an increasing population of spawners. They are young fish but they are increasing. We are seeing more spawning every year.

MR. WILLIAMS: Okay. Thank you for that. When we think of stocking, would I be correct in dividing it into a number of stages including the hatchery stage and the introduction of the fish, I'm going to call them fingerlings, I hope that's right, into the river system? There's

a couple of stages.

MS. SCHNEIDER-VIEIRA: There are several stages. The first stage would be the spawn collection because we are not going to be retaining adult fish within the hatchery. We go each year to a location and collect wild spawn. That spawn, those fish will be carefully identified such that we know whether or not we have used them previously for spawn collection because the intent is over time, each year we may only get one or two females. But over the many years of the stocking program, we want to ensure that we use a wide range of females with males to maintain our genetic diversity.

Then you are quite correct, they go into the hatchery. They will be raised to one of three ages, either as fry fingerlings, which are the fish, how old they are in fall, or yearlings. And then as you said they are reintroduced into the wild. Where you reintroduce them into the wild would depend both on the habitat assessments as well as the age of fish that you are reintroducing.

MR. WILLIAMS: And we're going to mostly talk about the hatchery, the introduction

to the river system. But just in terms of spawn collection, would I be correct in suggesting that over the 10 years that you have been, 10 or more years that you had been working in the Nelson River system, there have been some challenges in identifying females who are able to produce spawn?

MS. SCHNEIDER-VIEIRA: We have tested spawn collection for a number of years. I'm thinking three, but that's subject to check. And it is true that there are very few females in the areas that we are targeting, and we are not getting the very large females, which are very easy to identify, we have not seen. We have been exploring different technology in terms of examining the fish through -- I was going to say endoscope or some scope -- where you basically look to see what gender it is because they are hard to sex from the outside. So last year we did successfully collect spawn. And currently we do have some sturgeon that are being raised in the hatchery. But you are correct, it is a challenge because these are very depleted populations.

MR. WILLIAMS: Now I want to turn to the hatchery, and without going into detail at this point in time, we can agree that there are

times within the Manitoba hatchery where partial or complete die offs have been known to occur; agreed?

MS. MATKOWSKI: You're speaking about the Grand Rapids hatchery?

MR. WILLIAMS: Well, we can use Grand Rapids as an example.

MS. MATKOWSKI: Yes, at the Grand Rapids hatchery, the Whiteshell hatchery, University of Manitoba, they have all had to deal with what every fish culture facility has to deal with, and that's occasional mortality of different lots of fish.

MR. WILLIAMS: And that would be the same for the experimental facility in Pinawa?

MS. MATKOWSKI: Yes.

MR. WILLIAMS: So, I want to talk a little bit about the various risk points in the hatchery where partial or complete die off has been known to occur. And would I be correct in suggesting to you that one critical point where partial or complete die off has been known to occur is at the stage when one is weaning month old fish from live brine shrimp to frozen blood worm?

MS. MATKOWSKI: Yes, that's correct.

MR. WILLIAMS: And certainly based upon Manitoba experience, this is where a die off tends to be most likely?

MS. MATKOWSKI: Most likely.

MR. WILLIAMS: And based upon Manitoba experience, this would also be where the die off tend to be more severe. Agreed?

MS. MATKOWSKI: It can be more severe. It really depends on the fish husbandry practices. And at Grand Rapids hatchery, we have introduced standard operating procedures and we have increased staffing levels, and I believe that this has largely taken care of that issue. We have had 20 years of practice. And I have come to the conclusion that it's simply how well you take care of these fish, and how much attention you pay when you switch them from their initial food to their second type of food. And that is an entirely manageable issue.

MR. WILLIAMS: It would be fair to say that die offs happen simply changing from one natural food to another?

MS. MATKOWSKI: Absolutely. It depends who's taking care of them and how much

care and attention they are paying.

MR. WILLIAMS: Would it be fair to say that another point where partial or complete die offs could occur is when one is weaning the 10 day old yolk sack fry on to live brine shrimp?

MS. MATKOWSKI: Yes.

MR. WILLIAMS: Would it be fair to say that one can never breathe easy when lake sturgeon are in the hatchery?

MS. MATKOWSKI: I would say now we are much more confident in rearing lake sturgeon than we were five years ago.

MR. WILLIAMS: Now, no doubt --

MS. MATKOWSKI: Nobody is holding their breath.

MR. WILLIAMS: No doubt Manitoba Hydro tracks on an annual basis survival rates from the Grand Rapids hatchery, agreed?

MS. MATKOWSKI: Yes.

MR. WILLIAMS: And that information is available in an easily compilable form.

MS. MATKOWSKI: It's not available in an easily compilable form. What I do have -- what we do have is over the past couple of years, now that we are confident in our egg collection

methodology, we do have numbers for survival over the last couple of years. Before that, I would say it's -- we have only taken over operation of Grand Rapids hatchery in the last year. And so the records prior to that I would not be confident in.

MR. WILLIAMS: So if we ask Manitoba Hydro for an undertaking to produce the survival rate at Grand Rapids hatchery for the last 10 years, would you be prepared to take that under consideration?

MS. MATKOWSKI: No. I am not confident in the last 10 years. But what I can tell you is that in the last year, for instance, where we collected eggs at the Landing River and the Burntwood River, we had a very high survival rate of Landing River fish, a very high hatch rate, because that is the site where sturgeon had been collected by the Nelson River Sturgeon Board for years already. They have all the bugs worked out. They know how to do it. They are using the hormone gamotropic releasing hormone to assist the fish, so the egg quality they are getting is very high, and so their hatch rate is very high. I would easily say over 75 percent.

However, for the Burntwood River, when we tried this for the first year last year, we were thrilled just to get a spawning fish, and then to take eggs. And I think those eggs in the future will be of very high quality. But last year there were some bugs to be worked out. The temperature was a bit high. The pumps were not in the right place. And so we had a low survival rate on those fish. Still we have 600 Burntwood River fingerlings in the hatchery right now that we will rear over winter and we will stock as yearling fish, and that is our target for the Keeyask spawning.

MR. WILLIAMS: What was the survival rate from the Burntwood fish?

MS. MATKOWSKI: I don't know offhand. I would guess that it is less than 10 percent. And that's not an unusual thing in fish culture.

MR. WILLIAMS: Indeed, it would be fair to describe hatchery results as erratic in that one might have a really good year and a high success rate, juxtaposed with a very bad year and a low success rate?

MS. MATKOWSKI: I wouldn't call it erratic. I would say there are occasional

instances when we do not have a successful year. There has been one year out of the last 10 when we have not been successful in rearing fish for the Nelson River Sturgeon Board. And on average over the last 10 years, we have produced over 10,000 fingerlings out of Grand Rapids hatchery.

MR. WILLIAMS: What percentage would that be? Survival rate --

MS. MATKOWSKI: From egg?

MR. WILLIAMS: You've just given me the 10 years, what percentage would that be?

MS. MATKOWSKI: I could not tell you right now.

MR. WILLIAMS: Would it be fair to say that from time to time there would be inexplicable die offs at the Grand Rapids hatchery?

MS. MATKOWSKI: I would not call them inexplicable, I would call them the result of poor fish husbandry practices. And so we would be guessing after they occurred whether or not it was because someone didn't clean the tank or didn't provide the food at the right time. And as I said, Manitoba Hydro has taken over operation of Grand Rapids hatchery for about a year now. We have introduced standard operating procedures.

And so I would have to disagree with you.

MR. WILLIAMS: Okay.

MS. SCHNEIDER-VIEIRA: I was just going to make a couple of points. One is that one of the notes that I made in the presentation is that when we're looking at the Gull Rapids population of sturgeon, we have to date in the last decade found one year when we have had successful recruitment. So that's one in 10. And what was being described for the Grand Rapids hatchery is a much higher success rate. So a much higher potential frequency of successful recruitment in terms of introducing young fish to the wild. The other point is those 625 yearlings or fingerlings may not sound like a lot. That, if they are raised to yearlings in spring and released, that would be actually greater than the number of adults that are currently in the Split Lake reach.

And we know from some of the work that was done on the Upper Nelson River at Sea Falls when we compare the number of fish that were stocked as yearlings to the number of fish that we are recapturing, we're seeing very, very high survival rates for fish that were stocked as

yearlings. So even that failure, if you will, would represent a substantial number of fish being put into that Split Lake population.

MR. WILLIAMS: And thank you, Dr. Schneider, because we are going to get both to hatchery over the winter and to the introduction of fingerlings. But just while you've stepped back into the discussion, you spoke of the one successful year in terms of the existing environment, which is the 2008 year, in terms of the study area, agreed?

MS. SCHNEIDER-VIEIRA: Yes, that is true.

MR. WILLIAMS: And do you interpret the one in 10 year as being an indicia of a compromised environment?

MS. SCHNEIDER-VIEIRA: Yes, what we did is even in the "healthy population" such as the sturgeon population downstream of Pointe Du Bois, the amount of recruitment, if you will, of the size of that young year class varies considerably among years, but downstream of Pointe Du Bois we can see a much higher frequency basically of young sturgeon being detectable within the population. I should also point out

that the 2008 year classes are now five year old fish, so they are considerably easier to catch than the younger ones. The other thing I did want to point out is that in CEC round one, 0031, we did describe in detail the results of the comparison between recruitment in Gull Lake versus at Pointe Du Bois.

MR. WILLIAMS: Yes. And in terms of your stocking mitigation strategy, the current plan certainly contemplates the potential for the release of fall fingerlings into the river, agreed?

MS. SCHNEIDER-VIEIRA: Yeah, we have identified all three life stages or ages as being either as fry, fingerlings or yearlings, and the likely end result is going to be that it will be some combination of all three life stages. We anticipate that in developing the stocking program further, that both Fisheries and Oceans Canada, and perhaps more importantly Manitoba Conservation and Water Stewardship, will have significant input into the stocking program since they have to essentially authorize the fish handling that's required to enable it.

MR. WILLIAMS: And focusing on the

fingerlings experience, the corporation is aware of research on the Winnipeg River by Ms. Cheryl Klassen, et al, in terms of the success rates of fingerlings introduced into the Winnipeg River, agreed?

MS. MATKOWSKI: Yes.

MR. WILLIAMS: And while recognizing that Ms. Klassen's work is preliminary, she did examine the results from the stocking of fingerlings on the Winnipeg River between 2006 and 2010; agreed?

MS. MATKOWSKI: I believe that's correct.

MR. WILLIAMS: And would I be correct in suggesting that her preliminary research indicates a significant drop in weights for hatchling fingerlings recaptured within a few weeks of fall stocking?

MS. MATKOWSKI: I believe that's correct, and that would be expected.

MR. WILLIAMS: Would one relate a significant drop in weight to an inability to obtain food and a struggle for habitat?

MS. MATKOWSKI: Those fish when stocked would be searching for a spot that's

suitable and where they could find food. That time of year, their metabolism is slowing down as well. And so that's part of the reason that there would be a drop in weight.

MR. WILLIAMS: Might it be inferred that they were starving?

MS. MATKOWSKI: I don't know if you can infer that they were starving. Certainly a large percentage of stocked fish will not make it over the first winter. A large percentage of any fish will not make it over the first winter. The size of fish to be stocked is one of the things that we are certainly concerned with, and we are finding from our research right now that stocking yearling fish gives us a much greater success rate, the fish are that much larger. They are stocked in the summer when they have warmer water, higher metabolism and they are able to establish themselves better.

So our stocking plan, as Friederike has pointed out, has the flexibility to be modified as we learn which fish are going to survive the best. I don't think of it in terms of are they fingerlings, being zero age, a few months old, or are they yearlings. I think the size is

very important. And if we can get fingerlings to a large size, perhaps similar to what we get yearlings to now, maybe those will survive much better. It is something that we have learned a lot about in the last few years, and we know now that we have great success rate on our yearlings for sure. We know that some of our fingerlings have survived, but certainly not as many as our yearlings.

MR. WILLIAMS: At least one of the concerns you expressed to me in terms of the fingerlings at this current stage is their inadequate size which materially reduces their prospects for surviving?

MS. MATKOWSKI: That certainly can be, yes.

MR. WILLIAMS: Now, let's turn to yearlings now. Of course with yearlings, they have to stay in the hatchery for longer; agreed?

MS. MATKOWSKI: Yes.

MR. WILLIAMS: And it would be fair to say that the longer that fish are reared in the hatchery, the greater is the potential for disease transmission. Agreed?

MS. MATKOWSKI: Yes.

MR. WILLIAMS: And would it also be fair to say that Manitoba Conservation has expressed the concern that stocking older fish will create a population more suited to rearing in a hatchery setting than in the wild?

MS. MATKOWSKI: I believe they have. That is something that has happened with salmon species, for instance, on the West Coast. One of the ways of addressing that is to stock a variety of ages of fish. If we stock some of our larval fish, then if that's a problem with stocking yearlings, stocking the larval fish will allow some of those that would have been less likely to survive in hatchery, or be more likely to survive in the wild, to actually get out there into the wild. It's like not putting all your eggs in one basket.

MR. WILLIAMS: That was quite clever, whether inadvertently or not. I like that one.

Would it be fair to say that in terms of the hatchery fish, there has been a disease recently observed in the lake sturgeon?

MS. MATKOWSKI: I believe the last time that there was -- what was thought to be a virus in lake sturgeon from the Winnipeg River in

the University of Manitoba and possibly at the Grand Rapids hatchery, was 2010. And based on that occurrence, Manitoba Hydro has taken it as an opportunity to do some research. We have partnered with the Fisheries and Oceans Canada, with one of their fish pathology scientists, and she is doing a four year study for us of lake sturgeon viruses. She has identified a virus from those Winnipeg River fish, and she is developing a test for it, and we will be using that test on every lot of the fish that we stock from Grand Rapids hatchery to ensure that we are not stocking diseased fish into the Nelson River.

MR. WILLIAMS: And are you also testing or investigating the prevalence and distribution of this virus in the wild populations?

MS. MATKOWSKI: The same researcher will be doing that test. She already has samples from several different rivers in Manitoba, as well as the Rainy River in Ontario.

MR. WILLIAMS: Okay. I want to turn to the issue of Young of the Year and habitat. And again, it's to either of you, I'm just going to use Dr. Schneider, but please whoever wants to

go in. I think we have previously agreed that the availability of suitable habitat may be more limiting for Young of the Year than for adults? Agreed?

MS. SCHNEIDER-VIEIRA: That certainly may be the case.

MR. WILLIAMS: And in terms of what Young of the Year require apart from nurturing parents, certainly they are looking for -- they require a habitat that contains an invertebrate community capable of supporting the population. Agreed?

MS. SCHNEIDER-VIEIRA: That is true.

MR. WILLIAMS: And we tend to find them hanging out, Young of the Year, in habitat consisting of coarse sediments such as sand agreed?

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

MR. WILLIAMS: And we tend not to find them in habitat that is over-saturated with fine sediments such as mud?

MS. SCHNEIDER-VIEIRA: Well, that is actually a point of active discussion. There have been examples from the Winnipeg River system where

in the Great Falls reservoir where they actually were found on silty substrates. But it is true that the majority of places they were found, they have been on the sand substrate.

MR. WILLIAMS: And I'm going, for the purposes of my next couple of questions, define the word experimental as something that means an activity that has not been attempted before, okay, for the purposes of our conversation.

Would it be fair to describe Manitoba Hydro's efforts to create habitat for Year of Young as experimental?

MS. SCHNEIDER-VIEIRA: Yes, the Young of the Year habitat has not been experimentally created before. I mentioned that in my presentation and it was also highlighted in our environmental impact assessment.

MR. WILLIAMS: And I misspoke and said Year of the Young instead of Young of the Year, so thank you for correcting me.

And as I understand it, there are no successful examples of creation of Young of the Year nursery habitat for lake sturgeon?

MS. SCHNEIDER-VIEIRA: No one has attempted it.

MR. WILLIAMS: Now in the event that creation of Young of the Year habitat is undertaken, we can agree that the area of the preferred location for construction of the sand blanket will not be where Young of the Year sturgeon are currently located under existing conditions?

MS. SCHNEIDER-VIEIRA: Yes, that's true, because the reservoir will be created, the water flow conditions will change such that larval sturgeon drifting downstream are not expected to be able to even reach the place where they currently have habitat. In addition, I have noted, that habitat will be covered with silt. So the Young of the Year habitat will be created essentially from the change in velocities we believe they will settle out, and that is also coincidentally the place where you would expect to have sand in a natural river system.

MR. WILLIAMS: Okay. As compared to developing and maintaining adult sturgeon spawning areas, can we agree that the creation of habitat for Young of the Year is more complex?

MS. SCHNEIDER-VIEIRA: We can agree that it is less -- it hasn't been done elsewhere,

so it's associated with a higher degree of uncertainty. And that is also a point that we made in our impact assessment.

MR. WILLIAMS: And one of the degrees of uncertainty is whether or not the appropriate biota will invade the new habitat. Agreed?

MS. SCHNEIDER-VIEIRA: You're referring I imagine to invertebrates. What we find in the river system such as this is that there's actually quite a large number of invertebrates that periodically or continuously actually drift in the river column, so you can picture these small bugs, little fish flies and other things, they live in the bottom. Periodically they get up and they drift downstream and they recolonize in other areas. We have seen in other places, for example, when you look at newly flooded habitat land, within a year or so they will recolonize. So there's a lot of movement of invertebrates in the river system. And so we would expect that that this new sand area will become very rapidly colonized with invertebrates, as would be typical of a natural sandy area.

MR. WILLIAMS: So one of the issues,

though, will be the intensity of the benthic invertebrate invasion and the pace of it. Agreed?

MS. SCHNEIDER-VIEIRA: Yeah, based on, as I say, work that we have done in other places, both looking at how quickly invertebrates move back into the edges of lakes, for example, when the lake has been drawn down and then is raised again. You're seeing that within a season. It's very fast.

MS. MATKOWSKI: And I might add that there's always drift of invertebrates, and that is partially what the fish are picking up, is not necessarily only invertebrates that are produced where they are, but invertebrates that are drifting down with the current to them.

MR. WILLIAMS: Mr. Chair, I'm aware of the time. I have --

THE CHAIRMAN: It's just after ten after four.

MR. WILLIAMS: I may or may not conclude today. I'm getting very close, though.

And we have had some discussions in terms of -- over the last couple of days in terms of impact of previous hydroelectric developments. Would I be correct in suggesting that one impact

of the Churchill River Diversion in combination with Lake Winnipeg Regulation was to reverse the Nelson River pre-project seasonal water level and flow patterns in the Keeyask study area? I can elaborate on that if you like.

MS. SCHNEIDER-VIEIRA: Summer flows are basically the same and the winter flows have increased, so you don't see that seasonal variation any longer.

MR. WILLIAMS: In essence, you have increased the water levels and flows during periods of ice cover?

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

MR. WILLIAMS: And you have reduced the flows during the open water period?

MS. SCHNEIDER-VIEIRA: No. My understanding -- one second I'll just confirm -- no, it hasn't.

MR. WILLIAMS: We are jumping around a little bit here, but when we look at a long-lived population like lake sturgeon, would it be fair to say that in terms of the population that's currently in the study area, a number of the sturgeon in the population today were born prior

to the advent of hydroelectric development on the lower Nelson River?

MS. SCHNEIDER-VIEIRA: Yes, they were.

MR. WILLIAMS: And given that the first generating station on the lower Nelson River was built in the early 70's, it would be accurate to say that only a single generation of sturgeon would have matured since that time?

MS. SCHNEIDER-VIEIRA: Yeah.

MR. WILLIAMS: Would it be accurate to say that in terms of drawing definitive conclusions about the long-term, which I define to mean over more than one generation, affects of the habitat alteration, we're not there yet in terms of lake sturgeon?

MS. SCHNEIDER-VIEIRA: In terms of the lower Nelson River, no. We certainly have the examples which we have brought forward previously from the Winnipeg River system where we are looking at stations that are 100 years old, and there we have had multiple generations.

MR. WILLIAMS: Within the Nelson River system we're not there yet?

MS. SCHNEIDER-VIEIRA: Not in the lower Nelson River. Also the Kelsey generating

station was built in the early 50's, there would have been a couple of generations following that.

MR. WILLIAMS: I'd like to turn you to the other exhibit presented by CAC today, which is the production of the Canadian Science Advisory Secretariat, Recovery Potential Assessment of Lake Sturgeon in terms of Nelson River populations. And Dr. Schneider or others, in particular -- well let me back up. The Nelson River system was COSEWIC assessed and designated DU3 on or about 2007; is that about right?

MS. MATKOWSKI: Yes, 2006, 2007.

MR. WILLIAMS: And subsequent to this, there was a discussion paper provided by the Canadian Science Advisory Secretariat assessing the recovery potential assessment of lake sturgeon on the Nelson; agreed?

MS. MATKOWSKI: That is the requirement of the Species at Risk Act process. The Department of Fisheries and Oceans held a workshop to gather information and essentially update the COSEWIC status summary assessment, and assess the recovery potential of each designatable unit of sturgeon.

MR. WILLIAMS: And you spoke of

designatable units. So if we go to the very last page, being page 19 of this particular excerpt at the back, in essence there are -- the Nelson River has been divided into six different units, starting from number one, Playgreen Lake and Whitemud Falls in the south, and then moving up to the Limestone number 6, to Hudson Bay as well, agreed?

MS. MATKOWSKI: Yes, those are called management units, and they are parts of the designatable unit and essentially they are between the generating stations.

MR. WILLIAMS: And in terms of recovery potential in different parts of the management units, they range from a number of lows to one high being the region between Limestone and Hudson Bay; agreed?

MS. MATKOWSKI: That table is not indicating recovery potential. It is indicating with the first letter, you will see that the table is generally two letters, L, L, if I'm on the same one that you are, H, M. Oh, I'm not.

MR. WILLIAMS: I'm referring you to the very last page, which is page 19, and I apologize for my imprecision.

MS. MATKOWSKI: Yes. Then I agree, yes, those are the recovery potentials.

MR. WILLIAMS: Okay. At least as determined by this analysis; agreed?

MS. MATKOWSKI: Correct.

MR. WILLIAMS: I want to take you to page 11 for a moment. And to the paragraph just above limiting factors for population recovery. And I'll give you a couple, just a couple of seconds to read it, if you'd like.

So I'm just referring you to page 11 to the paragraph just above "limiting factors for population recovery," the paragraph that begins "In summary..." I'll just give you a second to peek at that.

Ms. Matkowski, you see that in this paper, they are flagging what the authors of this report consider the most important current threats to survival and recovery of lake sturgeon in this particular region; agreed?

MS. MATKOWSKI: That's correct, although that is not the conclusion section of the document.

MR. WILLIAMS: Yeah.

MS. MATKOWSKI: I have the whole

document, if you'd like it.

MR. WILLIAMS: I've got the whole document too. I just wanted to -- what they are flagging from their perspective, though, are concerns related to, one of the major concerns is habitat degradation or loss resulting from the presence of dams or impoundments. Agreed?

MS. MATKOWSKI: Yes.

MR. WILLIAMS: Another serious concern is pressure from fishing?

MS. MATKOWSKI: That's correct.

MR. WILLIAMS: And another concern they identify is population fragmentation which may result from the presence of dams or impoundments or other barriers. Agreed?

MS. MATKOWSKI: Correct, yes.

MR. WILLIAMS: What I was curious about in terms of this articulation of risk, would that be what Hydro identifies as the major risks in this system as well?

MS. MATKOWSKI: Right now the major risks in this system are fishing and barriers. And barriers that have these same effects that are described there, fragmentation and habitat change.

MR. WILLIAMS: Now you might want to

turn, and I will just get the reference from your powerpoint, I believe it's slide 66. And I believe Dr. Schneider was discussing it, but I'm happy with either of you. Dr. Schneider, on this page you flag recovery or mitigation methods used elsewhere, agreed?

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

MR. WILLIAMS: And I was intrigued by down near the bottom you flagged not only habitat creation but hydraulic manipulations. Agreed?

MS. SCHNEIDER-VIEIRA: Yes.

MR. WILLIAMS: But I didn't hear you discuss that in any great detail. Would I be correct in suggesting to you that by hydro manipulations used elsewhere, you would be referring to factors such as changing the operations of hydraulic flows or matters like that?

MS. SCHNEIDER-VIEIRA: There have been situations where they have provided flow downstream or flow appropriate for spawning sturgeon downstream, yes. Sorry, it can also be related to spawning habitat creation.

MS. MATKOWSKI: And that may be as

simple as just which turbines on the generating station you have on or off. Because if you have 10 turbines on, or rather you have 10 turbines and you really only need two on at a time, and you know the fish spawn over in front of two particular turbines, you can manipulate your flow to make sure that it's happening over that spawning area.

MR. WILLIAMS: And I guess the other manipulation, maybe I'm not using the right word here, that I've seen is dam removal, that's been another activity contemplated in other jurisdictions.

MS. MATKOWSKI: Definitely on the Red River in the U.S., they have removed several dams.

MR. WILLIAMS: Okay. When we talk about the objective of enhancing the population of sturgeon in this study area, Dr. Schneider, you would agree with me that measures such as stocking can be undertaken whether or not Keeyask proceeds?

MS. SCHNEIDER-VIEIRA: Yeah. Certainly stocking can proceed with or without Keeyask. However, stocking in terms of a program with the magnitude being contemplated for Keeyask is a very costly initiative, and so you would need

to -- I mean it would depend I guess on whether or not anybody would wish to do the stocking or the amount of stocking that would happen with or without Keeyask.

MR. WILLIAMS: You wouldn't ordinarily recommend the construction of a hydroelectric generating station and dam as a mechanism to restore threatened fish species, would you?

MS. SCHNEIDER-VIEIRA: That would be beyond the scope of what we would normally be answering. We weren't ask to assess --

MR. WILLIAMS: I am just playing with you.

MS. SCHNEIDER-VIEIRA: I know you are. It's late.

MR. WILLIAMS: Mr. Chair, what's the time?

THE CHAIRMAN: Five minutes.

MR. WILLIAMS: I think I will do it in less.

THE CHAIRMAN: Very good.

MR. WILLIAMS: So rare I get commendation, Mr. Chair, I'm so grateful.

THE CHAIRMAN: Enjoy it while you can.

MR. WILLIAMS: More in terms of the

literature review related to your cumulative effects assessment, would you have considered authors or authors who discuss cumulative watershed effects and watershed analysis such as Leslie Reid? Would that be an author that's familiar to you?

MR. DAVIES: I think that was a question that probably would have been more appropriate for panel 4 A.

MR. WILLIAMS: So, it wouldn't be something that's ringing a bell with you?

MR. DAVIES: Could you repeat the name, please?

MR. WILLIAMS: Leslie Reid.

MR. DAVIES: I'm not familiar with that name. I have reviewed a great deal of literature on that, but not that particular paper.

MR. WILLIAMS: Okay. And again, if this is unfair, you'll tell me. But would you have, again in looking at the cumulative effects assessment for an effects-based approach for watershed scale, would you have looked at any of the work of Alison Squires?

MR. DAVIES: I didn't look at her work specifically, but I was actually asked to attend

the workshop with Mr. Noble, and I believe the University of Saskatchewan in 2008 to look at cumulative effects assessments for watersheds. I was asked to attend as a practitioner to provide advice on actually what could be done in terms of a cumulative effects assessment of that magnitude.

MR. WILLIAMS: Okay. Thank you. Mr. Chair, I appreciate the patience of the Hydro panel and your patience as well.

THE CHAIRMAN: Thank you, Mr. Williams. That brings us to a minute or two from 4:30, so we're not going to continue with proceedings today. We'll resume at 9:30 tomorrow. We have two participants remaining to cross-examine this panel. So, we'll require at least the aquatic part of this panel back up at 9:30 tomorrow morning. Madam secretary.

MS. JOHNSON: Yes, I have a couple of documents to put on file. The aquatic presentation will be KHLP41. The two articles that Mr. Williams brought in, the Recovery Potential Assessment article will be CAC002 and the Home Range article will be CAC003.

(EXHIBIT KHLP41: The aquatic presentation)

(EXHIBIT CAC002: Recovery Potential Assessment article)

(EXHIBIT CAC003: Home Range article)

THE CHAIRMAN: Thank you. Any other business? Okay. We're adjourned until 9:30 tomorrow morning.

(Adjourned at 4:28 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.

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