MACKENZIE VALLEY ENVIRONMENTAL

IMPACT AND REVIEW BOARD

PUBLIC HEARING

SNAP LAKE DIAMOND MINE AMENDMENT PROJECT

EA1314-02

Mackenzie Valley Review Panel:

Chairperson	JoAnne Deneron
Board Member	Kirby Marshall
Board Member	Yvonne Doolittle
Board Member	James Wah-Shee
Board Member	Sunny Munroe
Board Member	John Curran
Board Member	Mike McLeod

HELD AT:

Explorer Hotel

Yellowknife, NT

June 5, 2014

Day 1 of 2

APPEARANCES

Alan Ehrlich	)MVEIRB
Chuck Hubert	)
Stacey Menzies	)
Simon Toogood	)
Sachi DeSouza	)
Mark Cliffe-Phillips	)
Catherine McManus	)
John Donihee	)Counsel
Kathy Racher	)MVLWB
Lindsey Cymbalisty	)
Zabey Nevitt	)
Ryan Fequet	)
Jessica Pacunyan	)
Elissa Berrill	)
Alex Hood	)De Beers Canada
Julie L'Heureux	)
Erica Bonhomme	)
Dave Putnam	)
Glen Koropchuk	)
Steven Ridge	)
Tom Omsby	)
Terry Kruger	)

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Shirley Tsetsa	)De Beers Canada
Doreen Apples	)
Martin Ignasiak	)Counsel
Peter Chapman	)Golder Associates
Hilary Machtans	)
Alison Snow	)
Tasha Hall	)
R. Bourke	)
K. Brettlaff	)
Sarah-Lacey McMillan	)Environment Canada
Carey Ogilvie	)
Anita Li (by phone)	)
Matt Hoover	)NSMA
Sean Whitaker	)GNWT
Robert Jenkins	)
Paul Green	)
Rick Walbourne	)
Lorraine Seale	)
F. Jackson	)
Paul Mercredi	)

APPEARANCES (Con't)

Lori McGregor	)GNWT
Lionel Marcinkosky	)
Jason Steele	)
Scott Stewart	)
Marty Sanderson	)
Ariane Vincent	)
Valene Gordon	)
Angela Norris	)
Lindsay Armer	)
Shafic Khouri	)
Tracey Covey	)
Leila Beaudouin	)
Rohan Brown	)Counsel
Don MacDonald	)MESL
Jesse Sinclair	)MESL
Todd Slack	)YKDFN
Josh Campbell	)
Marc d'Entremont	)DKFN
Stanley Louine	)
Mike Tollis	)LKDFN
Ron Desjerlais	)

APPEARANCES (Con't)

Don Hart	)EcoMetrix
David Alexander	)CANNOR/NPMO
Marie Adams	)
Zhong Liu	)SLEMA
Philippe DiPizzo	)
Walter Orr	)Stantec

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--- Upon commencing at 9:02 a.m.

THE CHAIRPERSON: Good morning and welcome to this public hearing. We will begin our morning with an opening prayer, if we all could stand, please.

(OPENING PRAYER)

THE CHAIRPERSON: Masi, James. My name is JoAnne Deneron, and I am the Chair of the Mackenzie Valley Impact Review Board. For those requiring translation, there are receivers available with English on channel 1, Chipewyan on channel 4, and Tlicho on channel 3.

Please be mindful of the translators as they would need people to speak at a moderate pace so that they would be able to keep up to the translation. Microphones are at the tables, and we ask that every time you're going to be speaking that you state your name and press the little button at the end of the speaker.

Some of the logistics for this room: The washrooms are just across the hall as you exit the door. The emergency exits are straight out the door and signed across the room.

We are here today to listen to what you have to say about De Beers Canada's proposed amendment to Snap Lake's water licence. The proposal includes changing the quality of effluent released into Snap Lake.

The Review Board is a co-management body established under Part 5 of the Mackenzie Valley Resource Management Act. The Review Board is the main instrument in the environmental assessment and environmental impact review of developments in the Mackenzie Valley. Board members are northerners nominated by First Nations organizations and by the Tlicho, territorial, and federal governments. The Review Board makes its decisions by consensus.

I will now briefly talk about the process that got us to this point. On December 20th, 2013, De Beers Canada Incorp., the Developer, made an application to the Mackenzie Valley Land and Water Board to amend its existing water licence for the Snap Lake diamond mine.

On January 22nd, 2014, this application was referred by the Mackenzie Land and Water Board to the Review Board for environmental assessment. The water licence amendment application was referred to environmental assessment based on judicial questions and concerns raised by parties.

The amendment would exceed De Beers's current limit for one (1) water quality perimeter, total dissolved solids, or TDS. The current limit was included by the Review Board in Measures number 51 and number 102 in the original Snap Lake environmental assessment that was completed in 2003.

On February 24th, 2014, the Review Board issued a draft EA scoping document for comment. Based on comments received from reviewers and the Developer, the Review Board issued its reasons for decision on the scope of EA for the Snap Lake diamond mine amendment on March 28th, 2014.

The reason for decision concluded that the proposed amendments would be assessed by the Review Board would only include total dissolved solids and all its constituents.

Since the Developer's amendment application included sufficient information to commence an assessment of those amendments, the Review Board did not issue a terms of reference and did not require the preparation of a Developer's assessment report. However, the Review Board required the Developer to submit additional information in order to satisfy

Sections 114, 115, and 117 of the Mackenzie Valley Resource Managements Act.

In particular, these sections require the Developer to describe the biophysical, socioeconomic, and cultural impacts of the amendment activities, as well as cumulative impacts, accidents and malfunctions, and alternative means of carrying out these activities.

The reasons for decision further stated that the water licensing process would address all of the proposed amendments that may be outside the scope of this EA. On March 25th the Land and Water Board and the Review Board issued a combined work plan; that plan describes joint process steps and timelines, as well as a separate EA hearing phase and regulatory phase.

Due to the limited scope of this EA, the Review Board has worked to follow a very efficient process coordinating information, gathering steps with the Land and Water Board. The two (2) Boards held a technical meeting -- a joint technical meeting on April 15th and 16th with follow-up Information Requests and Developer responses submitted by April 30th.

The two (2) Boards also hired an independent consultant provide -- to provide a neutral perspective on Snap Lake amendment application for the benefit of all parties. The independent consultant, EcoMetrix, submitted its report on May 8th, and will present its findings later today.

Board staff held a pre-hearing conference May 13th, 2014, which described document submission deadlines for parties and the Developer and the outlined hearing procedures. Parties were instructed to submit technical reports by May 21st. Technical reports were received from the Government of the Northwest Territories, the Yellowknives Dene First Nation, Lutsel K'e First Nation, Environment Canada, the North Slave Metis Alliance, and the Deninu K'ue First Nation.

De Beers submitted a response document on May 28th, and the parties were required to submit hearing presentations by May 30th and De Beers by June 2nd. Notification of this public hearing was posted on the Review Board's website on April 24th and was advertised in News North Northwest Territories on May 5th.

If we are able to complete the public hearing today, or tomorrow morning we will. However, we have this venue reserved tomorrow as a contingency. We will have coffee breaks and break for lunch at 12:00 to 1:15 and for dinner from 5:00 to 6:30 p.m. If the proceedings are not completed, we will reconvene tomorrow morning at 9:00 a.m. We are here to listen to your views about Snap Lake Water Licence Amendment Project. The operator of the existing Snap Lake Mine is De Beers Canada, Incorp., and it is the Developer in this environmental assessment.

This amendment application to the existing Snap Lake Mine Water Licence proposes changes to total dissolved solids discharged into Snap Lake from the mine. De Beers will present its application later this morning. Over the course of the day, we ask that you do your best to help the Review Board to understand your views about the proposed development's potential environmental, socioeconomic, and cultural impact, and your view of the potential significance of these impacts.

The Review Board will consider these views while it is deliberating on its decision in this environmental assessment. Once that decision is made, the Board will prepare a report of environmental assessment and send it to the GNWT Minister of Lands to consider and to distribute to other responsible ministers.

Before we go any further, I would like to introduce our Board members, and then introduce our staff and counsel. Our Board members include Michael McLeod, Sunny Munroe, Kirby Marshall, John Curran, Yvonne Doolittle, and James Wah-Shee.

Our staff include Mark Cliffe-Phillips, our executive director; John Donihee, our counsel; Chuck Birchall, counsel; Alan Erlich, manager of EA; Simon Toogood, EA officer and project head lead; Sachi DeSouza, EA officer, Chuck Hubert, senior EA officer -- he's around? Way at the back, okay. Stacie Menzies, logistics and planning director officer.

I have some additional comments on today's proceedings that I hope will make sure that everything goes smoothly. We have limited time, and the Review Board wants to hear what everyone has to say. Please note that there is agenda for the hearing which is available at the door.

At the pre-hearing conference, parties described their time requirements, and Board staff made every effort to meet those requests. I ask everyone to respect the time allotted for their presentations and questions and to use their time effectively. Presenters will be timed and given five (5) minute warnings. Please be advised that when your time is up, you may be interrupted. Keeping to your allotted time is important to make sure that everyone gets their fair chance to be heard and that the Board is committed to fairness.

The Review Board will be producing an official transcript of this hearing. This transcript will be available through our website and the public registry for this environmental assessment. Parties should be aware that they will be invited to ask questions in turn after each presentation. The order of questions will follow the list of parties shown on the agenda. After party questions, I will invite questions of staff, counsel, and Board members. Please address all questions to the Chair.

De Beers will give a presentation first. And after they have given their presentation, we have scheduled time to allow parties to ask questions. The order of questioning after each presentation will be as follows: The Government of the Northwest Territories, Yellowknives Dene First Nation, Lutsel K'e Dene First Nation, Environment Canada, the North Slave Metis Alliance, Deninu K'ue First Nation, De Beers Canada Incorp.

Questions must be asked with a microphone so that everyone can hear and the transcriber can properly record them.

There will be a public comment period

this evening. A list will be prepared for people who want to speak. Board staff at the back table will prepare this list. The Chair will call the names of people from this list during the public comment period.

I would also like to remind presenters that the scope of this assessment for the Snap Lake Mine licence amendment application includes only total dissolved solids and all its constituents. This is clearly stated in the Board's reasons for decision on March 28th.

As Chair, I will stop a presentation if the discussion is outside the scope of assessment. For example, discussion of consultation issues and the timelines for this assessment are outside the scope of this assessment and will not be included in presentations. Parties can briefly discuss matters concerning consultation during open statements.

At this time, I would like to ask legal counsel, John Donihee, to provide statements on preliminary matters.

MR. JOHN DONIHEE: Thank you, Madam Chair. John Donihee, Board counsel. There -- there are three (3) items that have come to the Board's attention which are of the nature of preliminary matters, and we want to bring them up for the parties to -- to address.

The first of those is simply a notification we received from EcoMetrix, that they were making a correction to slide number 8 (sic) in their PowerPoint presentation.

The Board's understanding is that this is simply a correction to bring the text of the PowerPoint into conformity with the actual evidence. So it's not new; it's just a correction of an error. And from the Board -- from the Board's standpoint, we'd invite anybody who has any issues or concerns with that to speak right now.

My apologies, slide 4.

(BRIEF PAUSE)

MR. JOHN DONIHEE: Madam Chair, it doesn't appear there's any issue there, so I'll -- I'll move on to the second of the items.

The -- the second item relates to a notification that the Board provided to the parties on the 30th of May, and it relates to new Board member, Yvonne Doolittle, and the fact that she is an employee of the Government of the Northwest Territories. The parties were notified and ident -- and -- and the

Board's position with respect to questions related to conflict and apprehension of bias where I -- were indicated, and we invited comments from parties, if -- if there were any concerns about Ms. Doolittle's participation in the hearing.

There -- there were no comments from any of the parties except for the Government of Northwest Territories. We received a letter on -- on the 3rd of June, and the issue from the Board's perspective is simply wanting to have clarification of -- of one (1) portion of that letter on the record.

And I'm referring specifically to the -- the indication that the Government of Northwest Territories has -- is suggesting that Ms. Doolittle would have to excuse herself from any involvement in any application in which the GNWT is an applicant or a participant. They're obviously not an applicant in this particular case.

It's less than clear to the Board what GNWT meant when they said, "or a participant," and we're -- we're inviting GNWT to clarify that for the Board on the record at this point.

MR. ROHAN BROWN: It's Rohan Brown, GNWT Legal Division. To clarify, then, with respect to this Environmental Assessment, GNWT's position is that there is no conflict, and that Ms. Doolittle can continue as a Board member. GNWT will, however, undertake to better clarify what was intended in the letter that was sent to the Board.

MR. JOHN DONIHEE: I thank -- thank you very much, sir. Madam Chair, I'll move on to the -- the third issue. It's John Donihee.

The -- the third issue relates to some concerns raised by the Yellowknives Dene First Nation about some new information which they suggest has been included in a PowerPoint presentation that De Beers is about to make.

And I won't go much farther than that with it, Madam Chair. I'll -- I -- I -- perhaps we could invite the Yellowknives to speak to their concerns, and then I would suggest that you hear from the other parties, and finally from De Beers Canada with respect to their views about how this matter ought to be dealt with.

(BRIEF PAUSE)

MR. JOHN DONIHEE: John Donihee, again. Madam Chair, Mr. -- it was Mr. Slack from the Yellowknives that raised this matter. Perhaps he can speak to it and indicate what -- what he would like the Board to do about it?

THE CHAIRPERSON: Mr. Slack...?

MR. TODD SLACK: Thank you, Madam Chair. Excuse me. I -- I think it's probably best if I just read the email that -- in which I raised this concern yesterday, and it's addressed to all of the parties who received this presentation, including Board staff and the proponent. And I'll read it verbatim. It -- it says:

"Hi, Simon and Alan. I've been doing some thinking, and I'm hoping the Board can make a quick decision on this, this morning -- tomorrow morning. I think that there is certainly a procedural issue to be considered, and that it -- and there may be a technical issue, as none of the consultants have had an opportunity to review the matters, and thus, I can't review the comments that they put into the public forum. To be clear, I'm not saying that there is a technical issue. I don't have the kind of expertise or ability, but if it hasn't -- if there hasn't been the ability for folks who have that expertise and ability to thoroughly review and challenge, I don't think it should form part of the discussion. I've just gotten off the phone with the proponent, Erica and Peter, and they stated that it -- and 'it' being the new evidence is not going to change anything they're going to present tomorrow. To me, this makes it easy. I think that the appropriate remedy is to ask the project to roll back their presentation and discussion to the point at which all of the parties had reviewed the -- the submission."

And by that, I mean the technical response that they provided. "That" -- oh, and I would go on to say that. Pardon me:

"That of the submission of the technical reports."

So -- so the technical reports were submitted maybe three (3) weeks ago, I'm not sure of the exact date, and these new numbers that were included in the presentation were provided since that point, and none of -- I don't believe any of the parties have reviewed the methods, or any of the technical information that go behind those.

And that's the concern that we have.

THE CHAIRPERSON: Thank you, Mr. Slack. I would like to ask each of the parties if they have any comments into Mr. Slack's comments that he has made.

If I could ask the Government of the Northwest Territories, any comments?

MR. ROBERT JENKINS: Thank you, Madam Chair. It's Robert Jenkins, with the Government of Northwest Territories.

In regards to what was put forward by -- by the Yellowknives, you know, in a general sense, new information that -- that arises right before the hearing is -- is, in our position, not appropriate for discussion at the hearing, because parties haven't had a chance to fully review or assess that, and even, I guess, with the limited time to -- to make a fulsome conclusion on whether this additional information even changes anything.

So, I guess we would put forward that it's probably not appropriate for inclusion in this hearing, as parties have not had sufficient time to review and assess.

Now, that said, the work plan moving forward could provide an opportunity for this -- for this information that was submitted recently to be -- to be looked at, and parties could, you know, make an assessment of it, and they could reflect that in their closing statements.

Important to note though, Madam Chair, that -- that the public record would need to stay open for this to occur.

THE CHAIRPERSON: Okay. Thank you. Lutsel K'e Dene First Nation, any comments?

MR. MIKE TOLLIS: Hi, Madam Chair. It's Mike Tollis, from the Lutsel K'e Dene First Nation.

We agree with the Yellowknives. We think it's inappropriate to present that material at this time as nobody's had a chance to review it, and I'd just like to note that it's not the first time that the Company has put forward information right before a -- a session with -- with the parties, so maybe we should -- I think we should not allow that to happen too much any more. Thank you.

THE CHAIRPERSON: Environment Canada,

comments?

MS. SARAH-LACEY MCMILLAN: Sarah-Lacey McMillan, with Environment Canada.

It is difficult for Environment Canada to make an opinion on the new material presented because we would like to review the lab reports and tests. So given the option, we would like to have the opportunity to be able to do that.

THE CHAIRPERSON: North Slave Metis Alliance, comments?

MR. MATT HOOVER: Thank you, Madam Chair. Matt Hoover, from the North Slave Metis Alliance.

The NSMA has been vocal about this since the beginning of this process, that the timelines have been extremely tight for technical review. As with the Yellowknives Dene, Lutsel K'e, we depend heavily on the opinions and expertise of those more scientific reviewers such as the GNWT, and we would like to agree with what's been stated so far, that we believe this information requires more thorough review and is not appropriate at this time. Thank you.

THE CHAIRPERSON: Deninu K'ue First Nations?

MR. MARC D'ENTREMONT: Thank you, Madam

Chair. My name is Marc d'Entremont, a technical adviser to the DKFN.

I would agree with the other parties on this issue. We, in particular, have kind of limited capacity and -- and resources available to participate in this, and -- and other types of hearings like this, and it's part -- partly evidenced by our late submissions to this process as well. So as said, I think we would agree with the -- the matter presented today by the YKDFN. Thank you.

THE CHAIRPERSON: De Beers Canada?

MR. MARTIN IGNASIAK: Good morning, Madam Chair. Thank you.

It is true that slide 8 introduces two (2) new test results. You'll see that -- that those slides consist of a table and two (2) rows have been added, and they've been clearly marked, "New."

I think that's to be expected, given De Beers has been and continues to undertake scientific testing to better understand Snap Lake. Really, that information was provided in this process as part of De Beers' ongoing commitment to engage stakeholders and regulators on the progress of its work.

I think even if these test results weren't provided in slide 8, it's quite likely that they would be introduced as part of this process, because I find it hard to believe we'd go through this process without any of the regulatory bodies or stakeholders asking De Beers to provide an update on the scientific work its undertaking and will continue to undertake.

So this is not the case where a -- a new type of evidence has been introduced and that it changes the position De Beers is -- is trying to advance through this hearing. It's simply two (2) additional test results to be added to many others. So our position's no one's prejudiced by this. It's part of the ongoing work that De Beers is committed to and that the slide should stay as is.

However, if this Board determines otherwise, what we'd propose is that the Board simply disregard the two (2) rows in that table for the purposes of its deliberation and that we not -- we -- and we proceed as scheduled this morning as opposed to having a requirement to take a break to physically alter the slides.

And I think that makes sense given these -- these test results are likely to come up at some point during the course of the day in any event. Thank you, Madam Chair.

THE CHAIRPERSON: What the Board would like to do right now then in hearing all the comments from members is that we would like to call a five (5) minute break while we deliberate and make a decision. Thank you.

--- Upon recessing at 9:33 a.m.
--- Upon resuming at 9:45 a.m.

THE CHAIRPERSON: Okay. If we could call everybody back, please. Just before the Board gives our ruling, we would like to ask if there's anyone online? Apparently we have Environment Canada, and I don't know if there's any other parties, but we would just like to test to see if they're able to hear us and if the connection is viable.

(BRIEF PAUSE)

THE CHAIRPERSON: Environment Canada, are you --

MS. ANITA LI (BY PHONE): Yes, Anita Li's here.

THE CHAIRPERSON: Okay. Thank you very much. It's working.

(BRIEF PAUSE)

BOARD RULING:

THE CHAIRPERSON: The Board has ruled as follows. The evidence is late, and we want parties to have a fair opportunity to review and comment on it. De Beers should be -- should file these study -- or these reports on the rec -- on the record before the end of the hearing.

The rows of new evidence in the PowerPoint should not be referred to. Slides do not need to be changed. The Board wants to proceed with the hearing. And the parties are to review new evidence and to speak to it on closing comments. We would want to proceed on current -- on a current timeline, and we can adjust it as -- if needed and De Beers has a final right to reply.

With that, we would like to start today's hearing with opening statements from De Beers, the parties, and the independent consultant, EcoMetrix. Opening statements are intended to briefly introduce each party and their team to the Review Board. De Beers Canada, please begin your opening statement.

OPENING COMMENTS BY DE BEERS:

MS. ERICA BONHOMME: Thank you, Madam Chair and Board members. My name is Erica Bonhomme. I'm the manager of environment at Snap Lake Mine, De Beers Canada. And I'm pleased first to introduce our panel representing De Beers here today.

To my far right is Dr. Peter Chapman, senior environmental scientist with Golder Associates. On my right is Mr. Glen Koropchuk, chief operating offi -- officer for De Beers Canada. On my left, from De Beers Canada, are Dave Putnam, head of safety health environment for De Beers Canada; Steven Ridge, regional engineering manager; and Julie L'Heureux, water manager.

Behind me from De Beers are Alexander Hood, permitting superintendent; and from Golder Associates, Tasha Hall, water quality specialist; Alison Snow, water quality modeller; Hilary Machtans, fisheries biologist; and Mr. Ignasiak, our legal counsel.

I'll now turn the mic over to Mr. Koropchuk.

MR. GLEN KOROPCHUK: Thank you very much, Erica. Madam Chairman, I'm Glen Koropchuk, chief operating officer for De Beers Canada. First of all, I'd like to thank you and the members of the Mackenzie

Valley Review Board, the other regular -- regulatory bodies, and community participants for this opportunity today.

I am pleased to be here to say a few words as you assess certain aspects of De Beers's application to amend the Snap Lake water licence. I'd like to thank you for being here today to help us work through this very important process.

Basically, we're here because nearly two (2) years ago De Beers was required to develop site-specific water quality objectives for total dissolved solids and its components, as well as a number of other response plans.

First of all, I would like to provide you and the Board members and the other participants with some information about De Beers Canada. We operate the Snap Lake mine, and in 2013 provided seven hundred and seventy-six (776) years of employment, including approximately two hundred and seventy-five (275) person years of Northwest Territory resident employment.

We have spent nearly $2 billion to build and operate the mine between 2005 and the end of 2013, which includes about $1.4 billion with NWT-based companies and joint ventures. We also operate the

Victor Mine in Northern Ontario and we are a joint venture partner in the Gahcho Kue Project. This will be our third mine in Canada and our second mine in the Northwest Territories.

Across Canada, De Beers employs directly approximately a thousand people. At De Beers, we remain focussed on safety and sustainably achieving our business targets. We develop and work hard to ensure a skilled Northern workforce. We're contributing to a growing Northwestern Territories economy, and to the livelihood of the residents in the NWT. We also assist communities through capacity development and social investment, and, key, we are active partners in protecting the land, water, air, and wildlife around our operations with our community participants.

As I said to the Mackenzie Valley Land and Water Board in December 2011, we recognize that Snap Lake has not always been trouble free. It is a very challenging mine. However, I would strongly suggest that anyone who visited the mine in mid 2011 would see a far different operation if they went back today.

During the past three (3) years, we have continued to improve our water management systems, and by the end of 2014 we will have invested -- we will have invested approximately another $20 million to enhance our ability to capture, pump, treat, and safely release water.

We agree that there have been unforseen changes at the mine since preconstruction predictions. Those are facts. But Snap Lake is no ordinary mine. We are mining a very thin kimberlite dike beneath an Arctic lake. Through nearly six (6) years of mining and three (3) years of construction, our understanding of the mine has grown significantly.

We know the rock that separates the mine from the lake is fractured. We continue to work to stop the flow of naturally occurring ground water that has been trapped in the rock for thousands of years. We have improved our mining operations, and we have adapted to the changes we have experienced. And we continue to adapt, we continue to do test work, and work to get better.

We know that the amount and quality of water entering mine workings is different than predicted prior to the start of mining. Even so, the water in Snap Lake remains safe to drink, and the fish safe to eat. In fact, Elders from communities close by Snap Lake who came to our mine for a visit and ate some of the fish caught in our September 2013 fish tasting rated the taste as very good or excellent. We know that's subjective, but it's indicative of our community engagement and the processes that we go through.

We're here today to demonstrate why the establishment of site-specific water quality objectives for TDS and its components will not result in significant adverse impacts to the environment. The Review Board has set a very clear scope for this assessment. Some participants may wish to raise other issues and ask other questions, and we will be willing to provide those answers in the appropriate forum.

In deciding back in 2004 that the mine could proceed to licensing, the Review Board set a limit for TDS that was based on predictions about water quality and quantity. It was not based on impact on the specific Snap Lake aquatic environment. Our continuing studies for this application have shown that higher levels of TDS in released water are protective.

We know from our ongoing engagement with communities that they are closely connected to the land, water, and wildlife. We also know they want to be assured that they will continue to be able to fish and hunt as they have for millennia. They want to know that their sacred sites will be protected. We also want that, too.

De Beers has built a strong, transparent, and respectful relationship with the communities and an engagement framework that will continue throughout this process, and throughout the life of mine. We are committed to that.

Finally, while we work to set appropriate and achievable water quality objectives, we continue to test a range of mitigation options that can be applied in parallel with new protective site-specific water quality objectives for TDS.

In undertaking the groundbreaking scientific studies that we will share with you and the public today that support our application, De Beers has added to the base of knowledge about the Arctic ecosystem. We have a greater understanding about fish and other organisms that live in Snap Lake.

The weight of evidence clearly demonstrates that releasing water which contains higher levels of TDS is safe and sustainable for the life of the mine. The water will be safe to drink and the fish safe to eat while mining is underway, and most importantly, when operations have ceased. We look forward to setting this and other water licence criteria with the Mackenzie Valley Land and Water Board later this year.

Madam Chairperson, panel members, regulatory and community representatives, thanks again for this communi -- for this opportunity. I would like now to go back to the program and turn over to the Chair or Ms. Erica to continue with our presentation. Thank you.

(BRIEF PAUSE)

THE CHAIRPERSON: For the next opening statements, we would like to follow the agenda. The Government of the Northwest Territories, opening statements, please.

OPENING COMMENTS BY GNWT:

MS. LORRAINE SEALE: Thank you, Madam Chair. My name is Lorraine Seale. I'm the manager of the Project Assessment Branch in the Department of Lands with the GNWT. My group coordinates GNWT technical input into environmental assessments.

With devolution, the type and nature of the technical advice government provides to the Review Board is very similar to what it was before April 1st. The main difference is that the GNWT is now providing much of the advice that Aboriginal Affairs Canada and

Northern Development Canada used to devi -- provide.

The development under assessment today deals largely with water issues. One (1) of the main reasons Lands is involved is because the AANDC minister has delegated to the minister of lands the authority to sign the final decision letter for this environmental assessment. Additionally, Lands has responsibility for land and water compliance and enforcement at Snap Lake.

Given the narrow scope of the development Robert Jenkins, to my right, with the director of water resources with the -- the Department of Environment and Natural Resources will be presenting on behalf of the GNWT, and he will be introducing his team as part of the presentation.

ENR now has responsibility for managing water resources in the Mackenzie Valley, and the minister of ENR has the delegated authority to approve Type A water licences.

(BRIEF PAUSE)

THE CHAIRPERSON: Thank you. Just again, some logistics. I have to state my name every time I push the button here, too. So JoAnne Deneron, Chair of MVEIRB. Our next opening statement will be from Environment Canada.

OPENING COMMENTS BY ENVIRONMENT CANADA:

MS. SARAH-LACEY MCMILLAN: Good morning. It's Sarah-Lacey McMillan. I am an environmental assessment coordinator with Environment Canada here in Yellowknife. Later this afternoon, Carey Ogilvie, the head of EA North for the prairie and northern region will be joining me. Also on the phone I'd like to introduce Anita Li. Anita is a senior engineer with the Expert Support and Contaminated Sites Division of Ontario. Anita has been providing our technical expertise with regards to water quality.

Given the time difference, she will not be available this evening to answer questions if Environment Canada is requested to present after the dinner break, and I just wanted to raise that for the Board in their consideration if the proceedings continue after the public has an opportunity to speak.

Environment Canada has been participating in the EA review process in order to provide specialist advice through its mandated responsibilities as it relates to water quality and impacts to receiving environments. The presentation we've prepared for these hearings summarizing -- summarizes our results, and we have identified some recommendations for consideration for the Board, so we look forward to making our presentation later today.

THE CHAIRPERSON: JoAnne Deneron, Chair of MVEIRB. Our next opening statement will be from Yellowknives Dene First Nation.

OPENING COMMENTS BY YKDFN:

MR. TODD SLACK: Thank you, Madam Chair. My name is Todd Slack. I'm the research and regulatory specialist for the First Nation. And I'm going to take the opportunity that you afforded to us to just briefly talk about the engagement that has or hasn't occurred on this file, and I'm very mindful of the time.

So this goes back to especially in 2011 when there was a water licensing technical session where we talked about TDS issues. At that -- at that session, the Yellowknives were very concerned about this issue, and advocated for the project to commence this -- both the establishing what the regulatory process would be and to get some meaningful action on what they were going to do about it.

Now, we can fast forward to 2013, when the project submitted a letter to you that all of these TDS issues had been addressed at the water -- the previous water licence, and that the Yellowknives had not raised any concerns, which isn't true whatsoever. And at those very sessions that they're referencing, they had promised further consultations.

None of this really happened. The first consultation that occurred in -- on TDS occurred on January 6th, and there was one (1) small session following that, and yet here we are today at an Environmental Assessment, where there hasn't been a meaningful opportunity for the First Nation to be part, and to work with the Company to resolve concerns.

Now, last thing that I'll say is that I think that there's an important perspective here between the Yellowknives and the Company, and it was revealed in their opening comments in which they felt that we're here because they were required to develop a site-specific water quality object -- objective for TDS.

No, they're -- we're here because they are not complying with the Board's previous decision to meet that 350 milligram per litre limit, and that is the central issue that the Yellowknives will be talking to today, and we look forward to presenting that -- that perspective, and hope that you find it compelling later today. Thank you.

THE CHAIRPERSON: JoAnne Deneron, Chair

of MVEIRB. Thank you, Mr. Slack. Our next opening comments is from the North Slave Metis Alliance.

OPENING COMMENTS BY NSMA:

MR. MATTHEW HOOVER: Thank you, Madam Chair, Matthew Hoover, North Slave Metis Alliance. The NSMA would like to thank you for the opportunity to speak here today. The NSMA has been involved with the project since the initial water licence approval and subsequent renewal in 2012/2013.

This water licence incur -- Environmental Assessment process is of significant interest to the NSMA members, especially at this time, due to the ongoing challenge of protecting the health of the aquatic environment. That being said, and in reference to the comments you made earlier today, we will do our best to limit comments on consultation during the presentation. If we do touch on that issue, I think you will see that it's in a concise way that does relate to worthwhile recommendations that are relevant to this process.

I hope that's appropriate today. And again, thank you for the opportunity to present.

THE CHAIRPERSON: JoAnne Deneron, Chair of MVEIRB. Thank you. Our next opening statement will be from Deninu K'ue First Nation.

OPENING COMMENTS BY DKFN:

MR. MARC D'ENTREMONT: Thank you, Madam Chair. My name is Marc d'Entremont. I'm a technical advisor to the DKFN, and with me today is Mr. Stanley Louine, councilman and Elder from the community as well. So then -- so we thank you for allowing us to be here today.

I guess the main reason we're here is because this is -- the Snap Lake is one (1) of the main projects that's within the traditional territory of the DKFN. However, DKFN has always been supportive of this and -- and other projects, as it sees the -- the benefits to both the -- the Northwest Territories, and in particular, the -- its community, and has always acted in good faith in -- in any discussions and -- and hearings and -- and processes in -- in regards to project development, despite the fact that there has been very minimal movement towards social impact benefit agreements within the community, which is also -- helps to hinder, as I mentioned earlier, some of the capacity and resources to participate in these types of processes.

So again, we -- we look forward to our

presentation later today. And thanks again for allowing us to be here.

THE CHAIRPERSON: JoAnne Deneron, Chair of MVEIRB. Opening statements from Lutsel K'e Dene First Nations.

OPENING COMMENTS BY LKDFN:

MR. MIKE TOLLIS: Thank you, Madam Chair. My name is Mike Tollis, representing the Lutsel K'e Dene First Nation. And just a quick comment on consultation. We were unable to be present at the technical sessions that happened -- that happened earlier. And we have not actually met with the Company to discuss this -- to discuss this environmental assessment since it began. The first participation that we had was submitting the technical report. So we haven't really had a chance to have a conversation. And I just wanted to put that on the record.

But since our participation started, we've been participating with the mandate of protection and conservation of the territory that the Lutsel K'e Dene have survived on since time immemorial.

The Lutsel K'e Dene have always lived in a -- in a balance that is sustainable, accessing natural and renewable resources in a way that protects the resources for future generations. Through our technical report and our presentation today, we look to encourage the Review Board and the Land and Water Board to require the Company to adhere to a higher -- to higher standards of environmental protection that have been practised at Snap Lake to date. That is to say, a more sustainable operation.

We believe that it is the responsibility of the Company to adhere to impact predictions that the original assessment was approved upon and that we understand predictions can occasionally be inacc -- inaccurate. If there are mitigation measures that can help the company attain these original discharge levels, then these strategies should be the first priorities rather than seeking higher limits.

The cost of environmental protection is a necessary cost. And if the Company is not voluntarily undertaking the necessary mitigations, then LKDFN is putting our faith in the Board to take a strong stance for protection of the land, and especially the water, for all time. Thank you very much.

THE CHAIRPERSON: JoAnne Deneron, Chair of MVEIRB. Opening statements from EcoMetrix.

OPENING COMMENTS BY ECOMETRIX:

DR. DON HART: I'm Don Hart, with EcoMetrix. I'm here as an independent consultant, invited by the Boards. I'm a senior ecotoxicologist with EcoMetrix. I was asked with several colleagues to review the documents that have been submitted by De Beers as part of the licence amendment application.

I should mention my colleagues, Mr. Ian Collins, a professional engineer, was responsible for looking at the water quality modelling. Mike Venhuis is a geoscientist. He was responsible for looking at the downwater flow modelling. And I've looked at the toxicology and the proposed WQOs.

We've focussed on several specific questions as posed by the Boards; in particular, are the proposed water quality objectives appropriate based on the modelling that's been done and the confidence in that modelling? Are those proposed objectives likely to be exceeded in the absence of mitigation? If that were to happen, what would be the potential effects in Snap Lake? And we were asked to -- to comment to the extent possible on -- on the feasibility of mitigation.

We've prepared a report expressing opinions on these issues. That report is on the record. And in my presentation today I'll try to summarize our thoughts on those issues.

THE CHAIRPERSON: JoAnne Deneron, Chair of MVEIRB. At this time then, we would like to ask De Beers Canada for their presentation to proceed.

(BRIEF PAUSE)

PRESENTATION BY DE BEERS:

MS. ERICA BONHOMME: Good morning. Erica Bonhomme. This presentation is in three (3) parts. My colleague, Dr. Peter Chapman, will provide additional commentary towards the middle of the presentation. My presentation will focus on the purpose and alternatives to the development proposal, and the extensive scientific investigation that has been completed to support it.

I will provide information about efforts underway to mitigate potential effects from the development, and summarize the assessed effects and cumulative effects of the development. I will cover how the development ties into the comprehensive monitoring undertaken by De Beers, and will conclude by providing an update on De Beers's ongoing engagement activities. Throughout this presentation, I will address comments and recommendations made by parties in technical reports that are within the scope of this environmental assessment.

De Beers proposes to change the quality of mine water to be discharged to Snap Lake. Specifically, De Beers is proposing to discharge mine water with a total dissolved solid, or TDS, content that is higher than currently allowable but that will not affect -- adversely affect the Snap Lake aquatic environment.

De Beers proposes that the current whole lake limit for total dissolved solids of 350 milligrams per litre be removed based on evidence that a site-specific water quality objectives, or SSWQO, of 684 milligrams per litre is protective of the environment.

De Beers proposes that the Mackenzie Valley Land and Water Board make a determination whether a site-specific water quality objective of at least 684 milligrams per litre TDS, and monthly effluent quality criterion, EQC, of at least 684 milligrams per litre TDS is appropriate, and that it consider the application of an interim EQC for a period of up to two (2) years.

The scope of this environmental assessment includes total dissolved solids and its constituents in Snap Lake. This includes chloride, fluoride, nitrate, nitrite, and sulphate. The development proposal derives from the requirement in the current operational water licence to submit three (3) management plans related to water quality by December 31st, 2013.

Two (2) of these specifically pertain to the scope of this environmental assessment. The TDS Response Plan and Nitrogen Response Plan are to include recommendations to the Mackenzie Valley Land and Water Board for appropriate site-specific water quality objectives for TDS including chloride and fluoride, nitrate and ammonia, in Snap Lake, as well as recommendations for associated EQC to be measured in mine water discharge at the end of pipe in order to protect aquatic life in Snap Lake.

These recommendations were to be based on the results of toxicity testing. The plans are also required to include identified sources of TDS and current practices, ongoing investigations, and issues related to minimizing TDS loadings to the environment.

This requirement to develop site-specific water quality objectives for Snap Lake was an outcome of the process to renew the operational water licence. During that process De Beers informed the

Mackenzie Valley Land and Water Board that mine water discharge and TDS loadings were greater than originally predicted in 2003, and that further evaluation of appropriate site-specific limits in the absence of national or provincial guidelines, as well as options for reducing TDS loadings to the environment, would be required.

The response plans and the development application provide comprehensive results of the scientific studies as well as investigations that have been completed or are underway to reduce loadings of TDS and nitrogen to the environment.

The studies show that the current licence limits for TDS and its constituents are overly protective and unnecessarily low, and that the proposed site-specific water quality objective for TDS, including chloride and fluoride, that are based on studies specific to Snap Lake are appropriate in that they are achievable, as well as protective of the aquatic environment over the life of the mine.

De Beers commissioned toxicity testing of nine (9) aquatic genera representative of Sna -- of Snap Lake using water also representative of Snap Lake. Results to date have shown that the proposed benchmark for TDS, 684 milligrams per litre, is lower than it could be with the exception of one (1) genus of water fleas which comprise only a small percentage of the zooplankton in the water.

Other organisms tested showed chronic responses very near to or well beyond a thousand milligrams per litre. Based on replicated testing of the water flea genus that is found in Snap Lake, they appear as a group to have a sensitivity to TDS at levels considerably greater than 684 milligrams per litre. And I -- as I said, in fact greater than a thousand milligrams per litre.

This table shows the present status of TDS toxicity testing. And although we've been asked to withdraw the results of testing of copepods which represent the dominant genus within Snap Lake, as well as three (3) additional tests of Daphnia magna. We note that with the exception of the water flea, Ceriodaphnia dubia, which is not found in Snap Lake, the TDS effect concentrations are greater than a thousand milligrams per litre. And De Beers concludes that the proposed TDS site-specific water quality objective of six-eighty-four (684) is not only conservatively protective, but an even higher water quality objective could be considered.

De Beers points out that since mining

operations began, the relative composition of mine water and Snap Lake water, including percentages of chloride and fluoride, has remained relatively constant and that a site-specific water quality objective for TDS inclusive of all its constituents will be protective of aquatic life as long as the composition of the mine water remains constant. The composition of mine water, which is reported monthly, is not expected to change.

In response to the recommendation that additional study be conducted on the reduction time of hardness, post-mining operations, De Beers has previously presented information that indicates that hardness will not decrease faster than those water quality objectives that are hardness dependent.

Dr. Chapman will now speak to other comments regarding the influence of hardness in his portion of the present -- oh, not yet, sorry, in his portion of his presentation.

An understanding of where TDS originates is important. In the groundwater and site models, which have been filed as part of the application, De Beers has reported that around 90 percent of the load to Snap Lake of total dissolved solids is from mine water pumped from underground mine workings. More specifically, ancient groundwater that is high in mineral salts called connate water is released during mining, particularly during footwall development.

De Beers has been investigating options to reduce overall mine inflows and to selectively reduce inflows of high TDS water through grouting. And while a full grout curtain has been deemed impractical, localized grouting continues to be undertaken and evaluated as a means to reduce TDS loading in mine water.

Following on De Beers's commitment to sustainability, De Beers continues to investigate other economically and technologically appropriate methods to reduce TDS and nitrogen loadings to the environment. Results are expected to be known later this year. A determination by the Mackenzie Valley Land and Water Board in a subsequent hearing on the final site-specific water quality objectives and associated EQC remains a critical design factor.

Our ongoing evaluation necessarily assumes that a site-specific water quality objective of six eighty-four (684) or higher for TDS will be approved. De Beers has previously presented a timeline for the evaluation of water treatment options, as well as factors that need to be taken into account when evaluation system feasibility.

Currently, De Beers is evaluating the results of pilot studies which will report on effectiveness, reliability, scalability, energy requirements, infrastructure, and waste outputs of a system intended to achieve the proposed effluent quality criteria specifically for the Snap Lake Mine.

The removal of TDS from mine effluent using proven technologies, such as reverse osmosis, ion exchange, evaporation, and crystallization, is certainly achievable. However, whether Snap Lake Mine can continue to operate as a mine if these mitigations are applied will be dependent on the factors listed above, as well as the final site-specific water quality objectives and effluent quality criteria approved for the mine.

Previous evaluation commissioned by De Beers, as well as a recent study commissioned by Environment Canada during the review of the metal mining effluent regulations, conclude that treatment for TDS, and in particular, the constituent ion chloride, will not be achievable if the current licence limits are maintained. Cost, infrastructure requirements, energy outputs, and importantly waste generation and its disposal will be prohibitive.

But although these are certainly critical limitations, De Beers has demonstrated in the evidence it has filed in its application that the current licence limits for TDS and chloride are likely overprotective and that higher limits will continue to be protective while supporting the current life-of-mine plan. For illustrative purposes, De Beers has provided models and predictions depicting the long-term water quality of Snap Lake and downstream lakes based on a mitiga -- unmitigated and mitigated scenarios.

The unmitigated scenarios depict the possible range of life-of-mine water inflows, outflows, and quality based on predictive water quality models. They are important in that they show how, over the life of the mine, water quality will change within Snap Lake.

De Beers cannot be certain that the proposed interim and final water quality objectives and effluent quality criteria proposed will be approved, and therefore, the unmitigated scenarios provide a picture of what would happen if no measures were applied to reduce TDS in effluent to meet a particular site-specific water quality objective.

De Beers does not expect this to be the case in the future. As a result, De Beers has presented models that depict life-of-mine quality if the proposed site-specific water quality objective of 684 milligrams per litre TDS is applied. The mitigated scenario depicts treated effluent discharge that will not cause significant adverse effects to the environment.

Over the time that mitigation options are being evaluated, designed, and implemented, De Beers proposes a TDS interim effluent quality criterion of 850 milligrams per litre, which will maintain TDS concentrations in Snap Lake below the site-specific water quality objective of six eighty-four (684) or higher until the -- at the earliest, 2016.

Predictive models submitted and previously presented by De Beers indicate that TDS concentrations in Snap Lake may approach those site-specific water quality objectives and associated EQC sometime in 2016 if no mitigation measures to reduce TDS loadings to the lake are applied.

In response to recommendations to consider the unmitigated scenario as a worst case, De Beers considers this scenario to be unrealistic, as an approved EQC will become a regulatory limit. De Beers agrees with the intent of the recommendation to implement mitigation sufficient to protect the aquatic environment and maintain traditional use of Snap Lake, and commits to implementing mitigation to achieve an appropriate and achievable site-specific water quality objective in Snap Lake.

In response to the recommendation that additional studies be submitted, De Beers points out that these studies are underway, that they are dependent on a determination of an appropriate site-specific water quality objective, and that De Beers has committed to providing regular progress updates to the Mackenzie Valley Land and Water Board.

De Beers agrees that mitigation to achieve an EQC will be based on a BATEA-type review. As mentioned previously, De Beers agrees that mitigation will be required to meet an approved site-specific water quality objective, and has committed to providing regular updates regarding progress to evaluate source control and treatment options.

In response to the recommendation that treatment and source control take priority over raising licence limits, De Beers has committed to implementing mitigation to reduce TDS loading to meet a site-specific water quality objective that is achievable, appropriate, and protective of the environment. De Beers has previously noted that lower site-specific water quality objectives than proposed will not likely be achievable.

I will now move on to summarizing the effects on the environment of the development. The proposed site-specific water quality objective upon which the proposal is based are conservative. Those results have been shown previously.

The site-specific water quality objective repro -- represents benchmark concentration of TDS inclusive of chloride and fluoride, below which there will be no adverse effects to the aquatic environment, and above which there may or may not be adverse effects. And by no significant adverse effects, we mean that the water will remain safe to drink and the fish safe to eat, and the ecosystem function of Snap Lake, specifically the fish and the food web they -- that supports them, will continue.

In proposing the water quality objective, De Beers has considered the potential effects to drinking water. We've provided evidence to demonstrate that the proposed water quality objectives for TDS will not pose any risk to the health of people who do, or who may in the future, drink water from Snap Lake.

While the water in Snap Lake may taste

different from what it did prior to mining began, the taste of the water will remain fair during the life-of-mine as measured against the Canadian Drinking Water Quality Guidelines.

De Beers has heard from Aboriginal groups that they would like to ensure that their potential use of Snap Lake in the future for fishing and other activities is not affected. De Beers predicts that with a site-specific water quality objective of TDS -- for TDS of 684 milligrams per litre, the taste of the water in Snap Lake will return to good within four (4) years, and excellent within ten (10) years of completion of mining activities.

The effects of discharging effluent to Snap Lake with higher TDS are reversible, and will not cause significant impacts to the environment or prevent potential land users from utilizing Snap Lake in the future.

De Beers has predicted that the effluent from Snap Lake Mine at the proposed eff -- EQC will be measurable in waters up to 44 kilometres downstream of the outlet of Snap Lake. There are no other developments within this section of the Lockhart River watershed that are known to, or may have, an effect on water quality within the same area.

It's obvious that the current operation of Snap Lake Mine is a factor to be considered relative to downstream water quality. However, the development proposal, if approved, will simply replace the current overly restrictive TDS limits with less restrictive but still conservative TDS EQC. As such, the development proposal inherently assesses the cumulative effects on the environment of concurrent and proposed mine effluent discharge to Snap Lake, and hence to downstream waters.

The assessment concludes that there is no potential overlap of the project's effects with other past and reasonably foreseeable developments, and that as such, the discharge of effluent at the proposed limits will not contribute to cumulative effects on water quality within the Lockhart River watershed. This map shows the predicted extent of effluent from other developments within the Lockhart River watershed.

In regards to several recommendations that the Canadian Drinking Water Quality Guideline of 500 milligrams per litre be applied, De Beers notes that this guideline pertains to aesthetic objectives, such as taste. Although we note that not everyone will notice a change in taste, the scientific studies undertaken for the water licence demonstrate that with the proposed site-specific water quality objectives, the water will remain safe to drink, and the fish safe to eat.

In response to the recommendation to also apply Canadian Drinking Water Guidelines to fluoride, again, the guideline is intended to protect against cosmetic effects to teeth, and is not based on adverse effects to human health.

De Beers has high confidence that the proposed water quality objective for TDS is conservatively protective. While the taste of the water will change for the duration of mine operations, the taste of the water will return to below the guideline in Snap Lake within several years of stopping mining. Throughout, the water will remain safe to drink and the fish safe to eat.

In regards to several recommendations for measures to ensure protection of Lady of the Falls, De Beers acknowledges the importance of this area to the Yellowknives Dene and Lutsel K'e Dene First Nations. The models that De Beers has presented using the proposed site-specific water quality objective at Snap Lake show that Snap Lake effluent will not be measurable beyond MacKay Lake, which is almost 400 kilometres upstream of Lady of the Falls. However, De

Beers commits to verifying its predictions by monitoring downstream of Snap Lake as far as the inlet to MacKay Lake as part of its Aquatic Effects Monitoring Program.

In regards to returning Snap Lake to pre-mining conditions post-closure, De Beers notes that water quality in Snap Lake will improve immediately post-mining, as there will no longer be TDS loading due to the discharge of mine water.

And I'll now turn the mic over to Dr. Peter Chapman.

(BRIEF PAUSE)

DR. PETER CHAPMAN: Peter Chapman. Masi, Erica. I will be presenting eleven (11) slides dealing with technical issues arising from the parties' reports and presentations. I will start with Environment Canada, who had two (2) recommendations. The first recommendation was to determine the concentrations of TDS, total dissolved solids, and chloride entering Snap Lake from both the North Pile and the water management pond via seepages.

We do not believe this -- this determination is either necessary nor useful. The major source of TDS and chloride to Snap Lake is clearly the treated effluent discharge. Adequate information on seepage quality is provided in the ARD annual acid rock drainage reports, which are provided annually. This information was also provided in the mine site water quality out -- update in the water licence amendment application that was submitted to the Board in December last year.

The next slide shows sources of inflows. In other words, of substances including TDS and chloride to Snap Lake for both the lower and upper bound effluent discharge scenarios. Note on the slide that effluent comprises greater than 80 percent of inflows in both cases. Streams which would not have elevated concentrations of TDS or chloride comprise several for less. Seepage inflows are minuscule in comparison to these two (2) sources.

Environment Canada's second recommendation was for monitoring to allow the early warning of possible stratification of Snap Lake. In fact, the monitoring recommended by Environment Canada is conducted and reported annually as part of the AEMP, the Aquatic Effects Monitoring Program. Snap Lake as a whole is not stratified. It's not expected to become such during operations. The lake becomes well-mixed over the open water season. Given wind-driven mixing of this relatively shallow lake, it is highly unlikely that Snap Lake as a whole will become stratified.

I'd now like to talk about peer review. As pointed out by the NS -- North Slave Metis Alliance and others, technical review is critically important, not just in terms of getting the science right, but also in terms of confidence in the answers that science provides. The technical work done in preparing for this application has been reviewed by two (2) independent groups, EcoMetrix, representing the Board, and MacDonald Environmental Sciences representing the GNWT.

The -- those technical reviews, with the exception of three (3) questions raised by MacDonald Environmental Sciences, and which I will discuss later, suggest that we really have gotten the science right, and hopefully they provide some level of confidence in the findings.

Conducting on -- continuing on the subject of peer review, I note we are preparing a total of thirteen (13) manuscripts for submission to international peer-reviewed scientific journals. I have two (2) slides on these manuscripts, most of which are in preparation. However, two (2) have been submitted to journals and being peer-reviewed while the manuscript of strontium has undergone peer review and has been judged acceptable for publication with some revisions.

Those revisions do not include any changes to the site-specific water quality objective, the SSWQO. The TDS manuscript is almost ready to go. We're just waiting to incorporate additional testing with Daphnia magna, the water flea, and copepods, both of which are small animals living in the water column. That testing was committed to in the mid-April technical session. I'll talk more about these tests later.

This slide shows the other six (6) manuscripts we are preparing and the international peer-reviewed journals we intend to submit them to. Okay.

(BRIEF PAUSE)

DR. PETER CHAPMAN: I would now like to turn to three (3) issues rais -- raised by the GNWT related to questions from MacDonald Environmental Sciences. The first issue relates to the fact that the Canadian Councils of Ministers of the Environment, the

CCME, in their document entitled, "A Protocol for the Derivation of Water Quality Guidelines for the Protection of Aquatic Life 2007," specify testing three (3) fish species, and I quote:

"Including at least one (1) salmonid and one (1) non-salmonid."

Unquote. We tested two (2) salmonids, lake trout and Arctic grayling. In April 2011, we began consultations with regulators and communities regarding toxicity testing to determine a TDS site-specific water quality objective. We were well aware of the CCME re -- requirements. I was the final peer reviewer on that document before it was released, and I did that on behalf of Environment Canada.

We could have met those requirement easily using standard laboratory test species. Lake trout and Arctic grayling are not standard test species, particularly when one is conducting testing beginning with the eggs and continuing testing through several months as the eggs develop. But lake trout and Arctic grayling live in Snap Lake.

And the testing we did with them was directed to the most sensitive life stage of both species to TDS, the developing egg. We tested both species two (2) ways, following input from Fisheries and Ocean Canada and others, we exposed the eggs after they were fertilized. In other words, after the sperm had reached the eggs to TDS, and we also fertilized the eggs in the presence of TDS. We got the same response in both cases for both test species -- both -- both fish species.

They are relatively tolerant to Snap Lake TDS compared to water fleas. We could have, as has been suggested, also have condu -- tested with the standard laboratory test species, fathead minnow, which is not a salmonid, but this fish species does not live in Snap Lake, and the standard test end points, growth and survival, are not as sensitive to TDS as those we tested for lake trout and arctic grayling.

We see no point in conducting additional tests that will provide the same answer as we already have. Fish are less sensitive to TDS than water fleas. Note also that EcoMetrix, on the basis of the testing conducted, supports the proposed TDS site-specific water quality objective.

We will, of course, as you saw previously, be publishing in the peer review literature on both the TDS site-specific water quality objective and the novel fish testing conducted as part of that SSWQO development.

Although we see no point in additional fish testing, at the technical session last month, we agreed to additional testing with other animals to address uncertainties. Specifically, we agreed to conduct additional replica tests for the water flea species, Daphnia magna, whose sensitivity to TDS forms a basis for that site-specific water quality objective, and to also conduct testing with copepods, which comprise a major portion of the zooplankton.

They are the small animals that live in the water and form part of the food chain for fish. Water fleas are a minor component of the zooplankton. Copepod testing was difficult, as there is no protocol for such testing in fresh waters. However, a salt water protocol was successfully adapted, and a fresh water copepod successfully tested against Snap Lake. At this point, I was going to talk briefly about these new results. I'm a scientist. We love data. We get excited about new data that'll help us solve environmental problems. However, given the Board's ruling, I will restrain myself, and simply note that reports on both the copepod and replicate Daphnia magna tests will be prepared and will be available for assessment and discussion before the end of the hearing process.

In summary, we believe that the testing conducted to develop a site-specific water quality objective for TDS is not only appropriate with this focus on fish and other organisms that actually live in Snap Lake, but has also produced a conservative result that will protect the aquatic environment of Snap Lake. There is no need for the additional level of conservatism from a safety factor. For example, dividing six eighty-four (684) by ten (10) to get sixty-eight (68).

I'd now like to turn to GNWT's third issue. CCME, in its 2007 document, states that water quality objectives can be modified by exposure and toxicity modifying factors. The GNWT does not disagree. However, they argue that changes in these modifying factors that occur following mining should not be considered.

This is not a new argument. It was made and dismissed at the Ekati water licence hearing for the very good reason that it does not make scientific sense.

The response provided by EcoMetrix, the Board's consultant that hearing, which you can see on the screen and which I will now read into the record, says it all. Quote:

"AANDC's argument ignores the scientific fact that increased water hardness, no matter its source, does reduce the toxicity of some substances. When asked about the validity of using anthropogenically modified hardness for calculating SSWQO, Dr. Dan -- Don Hart replied, quote, 'As far as I'm concerned, and I recognize that there are various opinions out there, but as far as I'm concerned, the organisms don't make a distinction as to where the hardness came from, so, yes, we're going to get a benefit from hardness that's released anthropogenically. It's still a benefit. I see no reason to ignore it'."

End both quotes.

My last two (2) slides relate to the spacial extent of TDS downstream of Snap Lake. With mitigation in place, predicted TDS concentrations were generally within the baseline range from MacKay Lake, which is approximately 44 kilometres downstream of Snap Lake.

Water in Lac Capot Blanc immediately downstream of Snap Lake is not predicted to exceed the drinking water aesthetic objectives for TDS or chloride.

This last slide shows the predicted spacial extent of TDS downstream under the mitigated scenario. The 2002 environmental assessment predictions are only exceeded upstream of King Lake. Further downstream, TDS concentrations are predicted to be within baseline.

Note that given the reality of both natural variability and laboratory analytical variability, and that point about laboratory analytical variability was noted by the Board technical staff during the mid-April technical session, small differences in TDS concentrations, such as 1 or 2 milligram per litre, do not provide good evidence that a change has occurred. This is why GNWT's suggestion that spacial changes will be measurable more than 65 kilometres downstream and possibly up to 155 kilometres downstream is an overestimation.

I will now hand back to Erica. Masi cho.

MS. ERICA BONHOMME: Erica Bonhomme. Thank you, Dr. Chapman. De Beers is required to conduct comprehensive monitoring -- monitoring of the aquatic environment related to the Snap Lake Mine operation. The mine's Aquatic Effects Monitoring Program, or AEMP, includes requirements to conduct site characterizations as well as monitoring of water quality, sediment quality, plankton, benthic invertebrates, fish community, fish health, and fish taste in Snap Lake.

De Beers studies water quality and hydrology at downstream lakes and applies a weight-of-evidence approach to analysis. The AEMP defines action levels in accordance with an approved response framework that is part of an ada -- overall adaptive management system to ensure ongoing identification, action, and monitoring of potential effects to the aquatic environment. A comprehensive report is submitted annually on May 1st. Similarly, a compliance report related to the Project Surveillance Network Program is submitted monthly.

To confirm predicted effects related to the development proposal, De Beers commits to undertaking monitoring of water quality at the inlet to MacKay Lake, and suggests that this be added into the current downstream lakes monitoring conducted under the AEMP.

In regards to the recommendation related to defining a high action level of response framework if the effluent reaches the outflow in MacKay Lake, De Beers will work under the Mackenzie Valley Land and Water Board process to review the AEMP response framework as may be required related to monitoring the effluent plume as part of the next AEMP redesign process.

And as an update to the information provided during the technical sessions, De Beers has recently met with members of the Deninu K'ue First Nation, North Slave Metis Alliance, Northwest Territory Metis Nation, Tlicho, and Yellowknives Dene First Nation communities regarding the proposed changes to effluent from Snap Lake Mine.

Chiefs and three (3) other members of the Yellowknives Dene First Nation toured Snap Lake Mine site on May 27th with a focussed -- with a focus, at their request, on water management during freshet conditions. On May 28th, De Beers presented information regarding management of chloride in effluent to the Snap Lake working group, and although we note at the meeting, at the request of the Mackenzie Valley -- we -- we note the meeting, at the request, the Mackenzie Valley Land and Water Board, was focussed on other aspects of mine operations.

De Beers will file an update to the engagement record by June 23rd, 2014. De Beers notes that questions and concerns related to the application were responded to during meetings, and are previously addressed in the application and supporting materials, but notes that in some of those meetings, no comments whatsoever were raised.

De Beers notes that in addition to the information presented to communities recently on the proposed amendments, environmental effects and mitigations, De Beers will invite community members to visit the Snap Lake Mine again in 2014, as we do every year, and to observe water management and other aspects of mine operations firsthand.

De Beers notes that it -- its meetings with communities often cover more than one (1) topic, since it often takes many months of communication to ensure that a mutually suitable time is arranged.

In summary, the proposed change to the quality of effluent to be discharged to Snap Lake will not have significant adverse impacts on the environment. De Beers has demonstrated that site-specific water quality objectives proposed for TDS, chloride, fluoride, and nitrate are appropriate and protective of the environment of Snap Lake.

Throughout mine operations and beyond, the water in Snap Lake will remain safe to drink, and the fish safe to eat. TDS in effluent will be measurable downstream as far as the inlet to MacKay Lake, and without overlap with the effects of other developments, there will not be adverse cumulative effects. Thank you.

THE CHAIRPERSON: JoAnne Deneron, Chair of MVEIRB. At this time we would like to call a ten (10) minute break, and right after the break, we'll proceed with questions.

Just a quick announcement, please. If you are coming into the forum here, could you please sign in by the door? There's a sheet there for you to sign in. Thank you.

--- Upon recessing at 10:55 a.m.

--- Upon resuming at 11:11 a.m.

THE CHAIRPERSON: JoAnne Deneron, Chair of MVEIRB. We will now go into the question period. Our first questions will come from the Government of the Northwest Territories.

QUESTION PERIOD:

MR. ROBERT JENKINS: Thank you, Madam Chair. My name is Robert Jenkins. I'm director of Water Resources with the Government of the Northwest Territories, Department of Environment and Natural Resources.

I'll probably just quickly introduce the people I have with me today because the questions will be coming from several people here in the group. So to my -- to my left I have Mr. Don MacDonald, of MacDonald Environment Services Limited. To my right I have Mr. Jesse Sinclair, also of MESL.

At the table behind me I have Mr. Paul Green and Rick Walbourne. They're both regulatory and science advisors in the Water Resources Division of -- of Environment and Natural Resources. And there's also behind me Mr. Sean Whitaker. He's a mining specialist with the Environment Division, again, within Environment and Natural Resources.

So I'll -- there'll be questions coming from several different people here in the group. And the first question will come from -- from Mr. Sinclair.

MR. JESSE SINCLAIR: Madam Chair, my name is Jesse Sinclair, with MESL, representing GNWT.

De Beers states in their presentation

that a site-specific water quality objective that is protective of the environment would be proposed. Protection of the environment is the key issue in this hearing, yet this statement means different things to different people.

What does De Beers define this to mean?

(BRIEF PAUSE)

MS. ERICA BONHOMME: Erica Bonhomme. For us, at a very high level, pro -- something that's protective of the aquatic environment at Snap Lake means that the fish -- the fish will remain safe to eat and the water will remain safe to drink.

MR. JESSE SINCLAIR: Madam Chair, I have a follow-up question, please. What are the specific metrics and targets example effect levels being used to determine if the site-specific water quality objectives that are proposed is going to be protective of the environment?

MR. PETER CHAPMAN: Peter Chapman. I would like clarification from Mr. Sinclair's question because I'm not sure whether he's talking about the end points for the site-specific water quality objectives or the monitoring that will be done afterwards.

MR. JESSE SINCLAIR: Madam Chair, Jesse Sinclair here again. What we mean by that is to get an understanding of the effect levels that will be used on the monitoring program to determine whether or not the site-specific water quality objectives being proposed would be protective of the environment.

MR. PETER CHAPMAN: Peter Chapman. Madam Chair, give us a second just to talk here.

(BRIEF PAUSE)

MR. PETER CHAPMAN: Madam Chairman and Board members, Peter Chapman. I'd refer Mr. Sinclair to the Aquatic Effects Monitoring Program which has all that information. I would also note that every -- periodically, every three (3) years, that is revised and there is a redesign. And the next redesign is coming up, I believe, in -- I'm not -- in a couple of years anyway.

(BRIEF PAUSE)

MR. ROBERT JENKINS: Thank you, Madam Chair. It's Robert Jenkins, with Environment and Natural Resources, GNWT. I guess -- Dr. Chapman, thank you for that answer and -- and referring us to the AEMP. I guess it's just -- in the interest of -- of those here today, I'm sure some of which are -- are not -- have an intricate understanding of the AEMP, or -- or remembrance of the AEMP, if you would be able to give a little bit more detail on some of the effects levels and -- and/or provide perhaps in an undertaking just what those are from the AEMP at some point in the near future?

DR. PETER CHAPMAN: Peter Chapman, Madam Chair. Give us a second, because I think we submitted the whole AEMP and it's also available on the record. I just want to check that.

(BRIEF PAUSE)

MS. ERICA BONHOMME: Erica Bonhomme. We -- the -- the information that's being sought after is in Chapter 6 and 7 of the Design Plan for the Aquatic Effects Monitoring framework and we -- plan. And we'd be happy to provide that for the Board's record.

It is, of course, on Mackenzie Valley Land and Water Board's website, but we'll make sure it's provided to the Review Board.

That sets out some of the action levels that fall in -- fall under the -- the framework that I think Mr. Jenkins is referring to.

(BRIEF PAUSE)

THE CHAIRPERSON: JoAnne Deneron, Chair of MVEIRB. I would like to have our legal counsel speak to the issue, please.

MR. JOHN DONIHEE: Thank you, Madam Chair. It's, John Donihee. I just want to note then that that will be Undertaking number 1. The date, of course, for the filing of undertakings is set out in the work plan. And that will be to file Chapter 6 and 7 of the AEMP on the -- on the Review Board's record. Thank you.

--- UNDERTAKING NO. 1: De Beers to file chapter 6 and 7 of the Aquatic Effect Monitoring Program (AEMP) Design report to the Review Board

THE CHAIRPERSON: If we could continue on with questions from the Government of the Northwest

Territories.

MR. ROBERT JENKINS: Thank you, Madam Chair. It's Robert Jenkins, Government of Northwest Territories. Thank you for that and for providing that information for the -- for the record for -- for the Review Board.

Moving on, I'll pass -- I'll pass it over to Mr. Don MacDonald to ask the next question.

MR. DON MACDONALD: Madam Chair, Don MacDonald, with MESL on behalf of GNWT. On the sixth slide that we had from the presentation there, De Beers stated that they have completed comprehensive toxicological studies on the effects of TDS. This work was specifically conducted to support the development of water quality objectives for TDS.

I note though that in Canada there are -- the CCME has established formal protocols and guidance for developing water quality objectives and water quality guide -- guidelines. This guidance identifies minimum toxicological data requirements for developing the Type A water quality guidelines for the protection of aquatic life.

And they require data on three (3) fish species, three (3) invertebrate species, and one (1) aquatic plant species. Well, the data that De Beers has generated to support the water -- proposed water quality objectives for TDS do not meet these minimum requirements.

So I'm hoping that De Beers can explain how these toxicological studies that they've described are conc -- comprehensive, when in fact they don't even meet the minimum data requirements for developing water quality guidelines and water quality objectives using the approved procedures and protocols that have been established by the Canadian Council for Ministers of the Environment?

THE CHAIRPERSON: JoAnne Deneron, Chair of MVEIRB. De Beers?

DR. PETER CHAPMAN: Peter Chapman. I think I provided a fairly comprehensive answer in my opening comments, but I will go further. I'd like to note to the Board that in the document entitled, "A Protocol for the Deriv" -- "Derivation of Water Quality Guidelines for the Protection of Aquatic Life 2007," which I believe is the document that Mr. MacDonald is referring to, in Part 2, Section 1-9, two (2) things are stated. First of all, and I quote:

"In fresh water systems salmonids are generally considered to be among the most sensitive fish and are routinely tested."

Unquote. We tested two (2) salmonids. We tested two (2) salmonids that live in Snap Lake. We tested them with a unique procedure that was developed based on people's concerns and based on the science that clearly indicated that routine testing was not appropriate. What we needed to do was test with the eggs, which would be the most sensitive, to really see what happens.

I'd also point on the same page, Part 2, Section 1-9, where under minimum toxicological data requirement CCME says that under exceptional circumstances you can make a change. And I put forward that these are exceptional circumstances because we focussed on the fish that were in the lake. We focussed on the organisms in the food chain that sustain the fish.

Way back in April 2011, we went through with people and we've continued to go through the food chain and what we needed to test. Getting consulting, you know, getting agreement from Fisheries and Oceans Canada and from everyone else as what we're testing. Sure, we could go out and we could test fathead minnow. We could do a survival and grow test. It would not give us anything else.

And in that line I would like to point out that it puzzles me that in MacDonald Environmental Sciences and their report which was appended to the GNWT technical report, they suggested using a SSD, a species sensitivity distribution, with some but not all of our data to develop a number that was a lot lower, in fact below the three-fifty (350). And I note that in there they added fathead minnow. But the interesting thing is they added fathead minnow in a study done by Wes Birge, et al in 1985, that the USEPA quotes as a chloride value.

It's -- really what we did was site-specific testing with the appropriate species to really understand and be protective of Snap Lake. We believe that we've done that and as soon as we complete, as I mentioned in my opening presentation, the reports on the additional testing, the copepods and the daphnia test -- and I do note with the daphnia test that we have done five (5) tests.

I'm not going to mention three (3) of the tests, but we -- we -- the two (2) tests that we did showed a benchmark higher than a thousand milligrams per litre. So it really is a convincing data set, and it's a unique data set. I really honestly don't know of another data set that has so many unbounded values. By 'unbounded values', what I mean is, when we test it -- and we tested the high concentrations where we expect to see effects. We saw no effects.

So really if you look at our data set, they're all greater than. And EcoMetrix noted that as well in their analysis of what might happen at higher TDS levels. We just have those lower levels. Six-eighty-four (684) was derived based on the initial daphnia test. We've done five (5) tests in total. I'm not going to talk the last three (3), but the first two (2) were reported at the technical session.

When we put those together -- and CCME advises when you have two (2) tests or more tests that were done the same with the same organism, you use the geometric mean. We got greater than a thousand. I could go on at greater length, but really this is a -- quite a good data set and we really believe it is going to protect Snap Lake. Thank you.

THE CHAIRPERSON: JoAnne Deneron, Chair of MVEIRB. Response, GNWT?

MR. DON MACDONALD: Madam Chair, Don MacDonald here, MDSL on behalf of GNWT. That answer, as long as it was, didn't answer the question unfortunately. And the -- the challenge we have with the work that has been done is that in Canada there are formal protocols and procedures for deriving site-specific water quality objectives or water quality guidelines. And what Dr. Chapman has described is a resident species procedure, and in Canada there's a clear set of steps that you must go through to implement the resident species procedure for deriving water quality objectives.

One (1) of those steps involves meeting minimum data requirements, which I identified previously. And the challenge we have is that although we've -- we've tried to implement the procedure, it hasn't been done properly. And so that results in some uncertainty about the results -- the -- the resultant site-specific water quality objective that has been proposed.

And then as a -- as a follow up to that, these -- these -- the CCME guidance on how to develop the water quality guidelines and site-specific objectives indicates that the objectives should be based preferentially on no effect levels, and these are things like concentrations of a contaminant that would effect 10 percent or fewer of the animals that are exposed to the contaminant under investigation.

And yet De Beers didn't report the low -

- the no effect levels for at least some of the toxicity tests that were conducted. And what I'm trying to understand then is why De Beers didn't design these tests so that they could provide reliable estimates of those no effect levels that we need to support the derivation of water quality guidelines using the Type A approach.

THE CHAIRPERSON: JoAnne Deneron, Chair of MVEIRB. De Beers...?

DR. PETER CHAPMAN: Peter Chapman here. Give me a minute. I just want to look at our response to the IRs because I believe we answered that there, and I'd like to quote from that.

(BRIEF PAUSE)

THE CHAIRPERSON: JoAnne Deneron, chair of MVEIRB. De Beers, are you ready?

DR. PETER CHAPMAN: Peter Chapman here. I haven't been able to find it. I'm going to rely on the people behind me to find it so I can quote from it, but I -- excuse me? They found it.

(BRIEF PAUSE)

DR. PETER CHAPMAN: Peter Chapman. In May 20 -- on May 28th, 2014, we provided a technical response. Section 2.1.1 talked about 10 percent versus 20 percent effect levels. I'm not going to waste time in going through that. That has been submitted.

Basically in that document what we did -- in the section is we pointed out the reality. We'd like to measure 10 percent levels. We'd like to measure zero percent levels. But it's not realistically possible in all tests for a variety of reasons that are outlined in that response. I can read it into the record, it's a long one, if you want, but you have it.

Yes, I totally agree with Mr. MacDonald. What we want to do is get down to no effect levels. I would point out also that USEPA clearly identifies 20 percent effect -- 20 percent effect levels as effectively no effect levels because with natural variability the problems with the tests, and trying to determine an effect from the variation in the test -- and we give examples there.

If you have a control -- because when you're doing testing, you have a control. And if you have one (1) animal die there -- anyway, I'm sorry. I'm going to get into details, and I don't want to bore you with technical details. The answer is there. We believe that we have determined no effect levels, and we've responded previously concerning that.

THE CHAIRPERSON: JoAnne Deneron, Chair of MVEIRB. GNWT's response, please.

MR. DON MACDONALD: Madam Chair, Don MacDonald, MESL, on behalf of GNWT. What I'd -- I'd like to emphasize here is that the Canadian Council of Ministers of the Environment is the national body that is responsible for the development of water quality guidelines in Canada. They have established formal protocols for developing these guidelines, and they are based preferentially on the use of no effect levels of contaminants for the purpose of identifying what the water quality guidelines would be. Those are -- are explicitly values that are associated with a 10 percent or less effect on the animals that have been exposed.

The CCME is comprised of a number of experts from across the country who are -- have a very strong understanding of the toxicological data -- data set and information with which they are utilizing and on the design of toxicity tests that are needed to support the -- the generation of data that can be used in this process.

And so -- and they've explicitly

identified the 10 percent effect type level as the -- or less as the no effect level and a 20 percent level that Dr. Chapman has referred to as a low observed effect level.

And so I'm -- I'm struggling still with trying to understand why De Beers seems either unwilling or unable to understand the guidance that has been established by our national body on this topic.

THE CHAIRPERSON: JoAnne Deneron, Chair of MVEIRB. De Beers, response?

DR. PETER CHAPMAN: Peter Chapman here. Okay, when we started out -- everyone wants to get a 10 percent effect level. That's the goal. You cannot realistically always get it. If you look at our data set, where possible, we have a 10 percent effect level. We documented why in some cases we went to 20 percent.

And I'll refer you back to two (2) portions of the CCME 2007 document which Mr. MacDonald is talking about. I'll refer you to Part 2, Section 3.1-2, at the top in the left-hand column. They talk about a preference ranking in the following order, from the most preferred acceptable to the least preferred acceptable endpoint repre -- representing a no effects threshold.

I fully agree that 10 percent, which is

the first one, is what we want to strive for. But CCME also says 11 to 25 percent is the next choice. And then I would also refer you to Part 2, Section 1-7 of that same document. And at the top on the right-hand side they talk about -- and I'll quote:

"A threshold level for negative effects is generally defined to the thre -- an effect level on more than 15 or 20 percent of the exposed individuals, so the negative effect greater than 20 percent."

So I contend again, not only are we -- you know, the science, as we believe it, is very clear. We have reached a no effect level. We are not in contradiction in any way of CCME 2007.

THE CHAIRPERSON: JoAnne Deneron, Chair of MVEIRB. To the question, Government of Northwest Territories.

MR. ROBERT JENKINS: Thank you, Madam Chair. It's Robert Jenkins, with GNWT. Thank you, Dr. Chapman for that response. And we will refer to some of that information and provide a response as necessary in our closing statements.

Moving on, I'm going to pass it over to Mr. Sean Whitaker. He's got a couple questions. And then we have an additional question after that by Mr. MacDonald. So we -- we've got, I think, about four (4) questions or so left, Madam Chair.

THE CHAIRPERSON: JoAnne Deneron, Chair of MVEIRB. Continue with questioning, Government of the Northwest Territories.

(BRIEF PAUSE)

MR. SEAN WHITAKER: Okay. Thank you, Madam Chair. Sorry, the microphone didn't work back there. I'd like to refer to slide 10. We're going to slightly change topics. Slide 10 states that the model for long-term reversibility shows that all parameters decline at the same rate as hard -- as the hardness.

De Beers's model shows this because all parameters were modelled conservatively. Parameters such as nitrates and metalloids may not behave conservatively in the environment and may cycle.

Did De Beers consider the potential for some parameters to not actively -- to not act conservatively as modelled?

THE CHAIRPERSON: JoAnne Deneron, Chair of MVEIRB. Could I please ask you to identify yourself, too?

MR. SEAN WHITAKER: Sorry, Madam Chair. Sean Whitaker, with Environment and Natural Resources.

THE CHAIRPERSON: Thank you. De Beers...? Sorry, JoAnne Deneron, Chair of MVEIRB. De Beers...?

DR. PETER CHAPMAN: Peter Chapman. I'm going to call on Alison Snow, modelling expert, to answer that question.

MS. ALISON SNOW: Alison Snow. For our closure modelling, where we ran our model for an additional one hundred (100) years, all of our parameters were modelled conservatively. So I did -- I -- we did not run the Snap Lake hydrodynamic model, which would...

(BRIEF PAUSE)

MS. ALISON SNOW: So for the closure modelling, as I said, all parameters were modelled as conservative constituents. We ran our closure model and our mass balance model for an additional one hundred (100) years after mining. I did not run our Snap Lake model, which models certain parameters non-conservatively for a hundred years after closure. I did not do that mainly because of timing.

THE CHAIRPERSON: JoAnne Deneron, Chair of MVEIRB. Government of Northwest Territories...?

MR. SEAN WHITAKER: Thank you, Madam Chair. Sean Whitaker, with Environment and Natural Resources. I guess my question would be, then, are you aware of any long-term studies that demonstrate that this is not important? I realize that you say timing, but the Government of the Northwest Territories is concerned that hardness may drop faster than the predicted rates of other metalloids, essentially creating a toxic condition post-closure.

THE CHAIRPERSON: JoAnne Deneron, Chair of MVEIRB. De Beers, your response, please?

(BRIEF PAUSE)

MS. ALISON SNOW: Alison Snow, no, we are not aware of any studies.

THE CHAIRPERSON: JoAnne Deneron, Chair of MVEIRB. Questions, GNWT?

(BRIEF PAUSE)

MR. SEAN WHITAKER: Thank you, Madam Chair. Sean Whitaker, with the Government of the

Northwest Territories, Department of Environment and Natural Resources. Thank you for that response.

I'm going to move on to another topic. It's building slightly on what Don had said, the national guidance for the der -- derivation of site-specific water quality objectives state that:

"A safety factor of ten (10) to one hundred (100) is required when developing Type D1 site-specific water quality objectives."

Which is what De Beers has done in this case. However, the department notes that De Beers' site-specific water quality objectives prior to the application of their safety factor was six eighty-four (684), yet after the application of the safety factor, it was still six eighty-four (684).

Can De Beers clarify how a safety factor of one (1) is a safety factor, given that its application resulted in no change to the original number?

THE CHAIRPERSON: JoAnne Deneron, Chair of MVEIRB. De Beers, to the question?

DR. PETER CHAPMAN: Peter Chapman. In response to Mr. Whit -- Mr. Whitaker's question, I'd refer him again to the May 28th, 2014, responses to technical issues arising from party's technical reports where we actually answer that. Again, in the interest of time, I don't see the point in referring to it, and I did answer it as well in my presentation, but I will provide some additional comments.

If you look at the data set, now that we've done the two (2) daphnia -- I'm not going to talk about the five (5), but everything is over a thousand milligrams per litre. Greater than. EcoMetrix did a analysis -- and I'm just going to find it here, if I may. Forgive me. A lot of paper.

(BRIEF PAUSE)

DR. PETER CHAPMAN: Okay. Peter Chapman again. Apologies, finding things. EcoMetrix, in their technical report, Section 4.1, did an analysis of our -- our data and what it looked like, and I remind the Board that EcoMetrix is the consultant to the Board. They're an independent consultant charged with looking at the science and seeing if it's right or not.

And basically, what they say in the second paragraph that in terms of the daphnia, which are the water fleas -- and I remind the Board the water fleas only comprise a two (2) -- a few percentage, 2 to 3 percent on average, of the zooplankton, and zooplankton are the little animals that live in the water. They're not a major component there. The major component are the rotifers, which we tested and reported on, and the copepods we tested, but I can't talk about those results. So we have data for both of those as well as the ones that aren't that important.

But anyway, to quote from the last two (2) sentences of the second paragraph from Section 4.1:

"At the worst case prediction of 1,700 milligrams per litre, we would expect at least 20 percent inhibition of reproduction
water fleas] and probably more. Extrapolation beyond the range of test concentrations is uncertain."

The next paragraph, and I quote:

"For the other invertebrates tested, rotifer..."

I'm not going to give the scientific name, because then we'll have problems putting it down in the record. I'll just leave it at that and if you trust me, I'm not -- you can read the thing:

"...rotifer, midge, and the fish

tested, lake trout, Arctic grayling, there was no dose response up to the highest test concentrations, 1,400 to 1,500 milligrams per litre. Daphnids are a minor but sensitive part of the zooplankton community. Therefore, at TDS concentrations of 1,700 milligrams per litre, we might expect reduced abundance or possibly loss of sensitive zooplankton species [referring to the daphnias], but little effect on low tolerant invertebrates or fish."

So in addition to the previous answers I've given, from the EcoMetrix report -- and again, we're looking at six-eighty-four (684), not seventeen hundred (1,700) or a thousand at this point in time. You know, it's not going to have a big effect on the -- it's not going to affect the functioning of Snap Lake.

Now, that leads me to the safety factor question. Safety factors are something arbitrary. We have a safety factor of ten (10), frankly because we have ten (10) fingers on hands. If we had -- sorry, five (5) fingers on each hand, I apologize, which makes a total of ten (10). If we had six (6), we'll have safety factors -- probably factors of twelve (12). They're arbitrary.

And in one (1) of the responses -- I'm not going to -- I can look for it if you want, but one (1) of our responses, I went back and I pointed out the CCME quotes, the paper that I and colleagues wrote back in 1998, looking at the whole issue of safety factor and how arbitrary they are. Nowhere is it stated that you can -- you must have a safety factor of a certain amount, except in the case -- I'm sorry. Let me go -- let me back forward.

In CCME, there's two (2) -- there's a couple of ways that you can do -- develop your benchmarks. One (1) is by means of a species sensitivity distribution, and in our evidence, we tried to do that, but the problem we had is that all -- so much -- so many of the data points we don't know the end point. They're just too high. We only have those smaller data points.

The other way is, again, if you have to find data points, to add a safety factor of ten (10). As I mentioned, six-eighty-four (684) divided by ten (10) gives sixty-eight (68), which is nonsensical. It's far too low. So we looked at the data, we evaluate it, and basically what we're looking at is a no effect level, 20 percent perhaps, but effectively a no effect level, we would argue, to a small organism that comprises a very small proportion of the zooplankton community, everything else will be fine above that. It makes logical sense to us that this will be protective, and we don't need a safety factor beyond one (1).

THE CHAIRPERSON: JoAnne Deneron, Chair of MVEIRB. Just to be mindful again of our translators that are trying to keep up to the speaking of the members. GNWT, your response, please, or question?

MR. SEAN WHITAKER: Thank you, Madam Chair. Sean Whitaker, with the Government of the Northwest Territories Department in Environment and Natural Resources, and I am going to slow myself down right now.

Thank you, Dr. Chapman, for that response. We note the sections that you have provided. We will provide that in our closing comments. We have a point of disagreement, so I'm going to move on to another question.

Madam Chair, on slide 13 -- I would like to refer to slide 13, if you guys want to go -- switch forward, or -- throughout the environmental assessment process, the Government of the Northwest Territories has requested detailed information on specific mitigation measures to be implemented by De Beers. However, to date, there has been no definitive response from the Company.

As a result of the uncertainties related to these unknowns, the Government of the Northwest Territories was forced to assess an unmitigated scenario. It is important to establish the level of mitigation prior to activities to assess things like accidents and malfunctions, cumulative effects.

ENR additionally notes that on slide 25, that De Beers has noted that a site-specific water quality objective for TDS may not be achievable at five hundred (500). Our question is, we would like to -- De Beers to describe the level at which De Beers believes is an achievable extent of mitigation.

THE CHAIRPERSON: JoAnne Deneron, Chair of MVEIRB. De Beers, your response, please?

MS. ERICA BONHOMME: Erica Bonhomme. I'd like to thank Mr. Whitaker for pointing out an important point that we've made as well, which is we need to assess the site-specific wal -- water quality objective prior to activities. We need to know what that is before we can advance to developing certain mitigation technologies that will meet that objective.

A summary of best available technologies for treatment of Snap Lake effluent was provided to the Board in April 30 -- on April 30th in response to the Review Board's IR number 3, and was based on studies completed by a number of consultants, including one (1) commissioned by Environment Canada.

We've undertaken and evaluated a number of technologies to reduce TDS loadings to the environment. We've -- we've acquired additional data to reduce uncertainty in our models, and we've completed the toxicity testing that supports our site-specific water quality objectives.

We have committed to providing the Board, as soon as they're available, the results of the evaluations of pilot treatment -- pilot studies for treatment options that are currently underway, and we've provided some additional steps -- the timeline for additional steps that go along with that.

THE CHAIRPERSON: JoAnne Deneron, Chair of MVEIRB. Response, GNWT?

MR. SEAN WHITAKER: Thank you, Madam Chair. Sean Whitaker, with Department of Environment and Natural Resources. I'm going to pass it back to Mr. Don MacDonald.

MR. DON MACDONALD: Madam Chair, Don

MacDonald, MESL, on behalf of GNWT. I'd like to move on, please, to slide number 40 in De Beers's presentation.

(BRIEF PAUSE)

MR. DON MACDONALD: Thank you. This is Don MacDonald, again with MESL on behalf of GNWT. The graph on the lower left of this slide seems to support De Beers's prediction of how far downstream water quality changes can be detected, and -- and I think this is an important slide for everybody to understand, including me, and so I have a couple of questions related to this.

So, first of all, there's -- it looks like two (2) lines that are virtually superimposed on one another, one (1) of which is the base -- sorry, one (1) of which is the EAR -- my eyes are not so good anymore, EAR predictions, and the second is the upper bound and lower bound.

I'm -- I'm just trying to understand what levels of TDS in the effluent were used in generating this prediction of the concentrations of total dissolved solids in the receiving waters of the Lockhart River basin?

THE CHAIRPERSON: JoAnne Deneron, Chair of MVEIRB. De Beers...?

MS. ERICA BONHOMME: Erica Bonhomme. The -- as the inset suggests, it -- it is a mitigated scenario. These -- it applies a model where the site-specific water quality objective in Snap Lake is 684 milligrams per litre. What changes under the upper bound and lower bound is the flow itself.

THE CHAIRPERSON: JoAnne Deneron, Chair of MVEIRB. The Government of Northwest -- or the Government of Northwest Territories, your response, please?

MR. DON MACDONALD: Thank you, Madam Chair. Don MacDonald, MESL, on behalf of GNWT. Okay, so that's -- that's helpful. Thank you ver -- thank you for that.

Now, there's also a couple of other lines that are -- horizontal lines on this figure. One (1) is -- I think they identify the baseline range, if I can read that carefully from here.

Could someone from De Beers please confirm that that is in fact the baseline range, and then maybe tell us a little bit about what those -- how those numbers were arrived at so that we can better understand how the prediction of 44 kilometres was generated?

THE CHAIRPERSON: JoAnne Deneron, Chair of MVEIRB. De Beers, your response, please?

MS. ERICA BONHOMME: Erica Bonhomme. I'm going to ask Alison Snow to respond.

MS. ALISON SNOW: Alison Snow. So the baseline range was based on data from the EAR that was collected in 1993, 1994, and 1999, and our baseline range just represents the minimum and the maximum of those data points for total dissolved solids.

THE CHAIRPERSON: JoAnne Deneron, Chair of MVEIRB. GNWT, to the question, please.

MR. DON MACDONALD: Madam Chair, thank you. This is Don MacDonald, MESL, on behalf of GNWT. So what I understand, then, is that the prediction of 44 kilometres downstream, where the influence of the mine could be detected relative to baseline conditions is where those predictions of future water quality cross the upper bound of that reference range.

Is that correct?

THE CHAIRPERSON: JoAnne Deneron, Chair of MVEIRB. De Beers, your response, please.

(BRIEF PAUSE)

MS. ERICA BONHOMME: Erica Bonhomme. Yeah, we're just reviewing the information. Give us a moment, please.

(BRIEF PAUSE)

MS. HILARY MACHTANS: Hilary Machtans, for De Beers. That is not correct.

So the -- the -- this plot is just a schematic to give a frame of reference. The model material and how the downstream concentrations are calculated is found in Section 2 of the supplemental filing, so all the specific details of the modelling and how it was done are provided there. This plot is just to give a frame of reference for how the predictions fit within the existing baseline data, and -- and the -- and the Environmental Assessment predictions from 2003.

So it's just supposed to give context.

THE CHAIRPERSON: JoAnne Deneron, Chair of MVEIRB. GNWT...?

MR. DON MACDONALD: Thank you, Madam Chair. Don MacDonald, MESL, on behalf of GN -- GNWT.

And so I'm -- I'm still trying to understand the process, then, that De Beers has used to develop their predictions of how far downstream the effluent -- the influence of the effluent can be detected within the Lockhart River system.

I'm -- I'm still unclear, and -- and maybe it's just happenstance that -- that those predictions cross the line about 44 kilometres downstream of Snap Lake. So I'm -- I'm just -- I'm really trying to understand what has been done here in these predictions.

THE CHAIRPERSON: JoAnne Deneron, Chair of MVEIRB. De Beers, your response, please, in one (1) moment.

(BRIEF PAUSE)

MS. ERICA BONHOMME: Erica Bonhomme. It's -- it's very simple. It -- where we say there's a -- an -- an effect 44 kilometres downstream is where we can detect a measurable change above baseline that's attributable to Snap Lake effluent.

THE CHAIRPERSON: JoAnne Deneron, Chair of MVEIRB. GNWT, response to the question, please?

MR. DON MACDONALD: Yes, this is Don MacDonald again, MESL, on behalf of -- of GNWT. So what I'm really trying to understand is -- is what baseline was used specifically.

So what's shown on this graph is a range of baseline conditions. I -- what I think I just heard was although that's on this graph, this wasn't used in this analysis. So I'm trying to understand, then, what was used?

Could -- could De Beers please enlighten me?

THE CHAIRPERSON: JoAnne Deneron, Chair of MVEIRB. De Beers, your response, please?

MS. HILARY MACHTANS: Hilary Machtans, for De Beers. Can I just clarify, is your question: What is the origin of the baseline data and what year was it collected?

THE CHAIRPERSON: GNWT...? JoAnne Deneron, Chair of MVEIRB. GNWT, your response, please?

MR. DON MACDONALD: Thank you, Madam Chair. Don MacDonald, MESL, on behalf of GNWT.

No, that's not the question. The question is specifically how was -- there's a number of data points that are shown on this graph with 'X's. And you'll see that sort of line that -- that starts off around some value, maybe around eighty (80) or so, and then drops down across that baseline line, and then goes up and down.

And on -- along that line, I see various 'X's, and what I'm trying to understand is what -- what specific data were used to establish baseline for each of the locations for which these predictions were made?

THE CHAIRPERSON: JoAnne Deneron, Chair of MVEIRB. De Beers, your response, please?

MS. HILARY MACHTANS: Hilary Machtans, for De Beers.

That -- each 'X' on the plot represents -- represents the prediction that was made in the original EA, and the same data that was used in the original EA, that represented baseline data from which the horizontal line is created. So the range of baseline data was collected by the federal government in the 1990s, and that's the same data set that was used.

And that was presented in the original EA, as well as rediscussed in the supplemental filing. So the range of those -- those exact data points represent sample stations from the federal government along the Lockhart River. And that's what those yellow dots are, if you will, along the plot.

There's -- there's stations, long-term monitoring stations from the federal government. And the data set used was the data set from the 1990s.

This was also discussed in the technical session on April 14th and 15th, and De Beers had committed to updating that data set to see what additional data was available now from that. And so De Beers is continuing to work with both the GNWT, Environment Canada, and Aboriginal Affairs to obtain that data and then have it updated based on the data set for the Lockhart River.

THE CHAIRPERSON: JoAnne Deneron, Chair of MVEIRB. GNWT, to the question, please.

MR. DON MACDONALD: Thank you, Madam Chair. Don MacDonald, MESL, on behalf of GNWT. That's -- that explanation was very helpful and it sets up, I think, what is my last question here.

And it's -- it really gets at the question, from De Beers's perspective, what procedure would be used to evaluate a deviation from baseline conditions? And I mean specifically, what procedure would be used? What arithmetic procedure would be used to evaluate a deviation from baseline conditions, and what would the minimum deviation from baseline conditions that could be measured? What is that? What is that value in terms of milligrams per litre for TDS?

THE CHAIRPERSON: JoAnne Deneron, Chair of MVEIRB. De Beers, your response, please.

MS. ERICA BONHOMME: Erica Bonhomme.

If you'd just give us a moment, please?

(BRIEF PAUSE)

MS. HILARY MACHTANS: Hilary Machtans, for De Beers. Thank you, Madam Chair, for the break there. So it -- it's a very good question.

So the -- the De Beers Aquatic Effects Monitoring Program is the place where that level of detection is possible, so De Beers currently monitors at what -- what's labelled on that map as King Lake, and we are able to detect changes within, you know, a number of milligrams per litre.

So the precision around the detection is not fully known yet, so that's a fair question, and De Beers has plans to work with the various government departments to determine where -- what the range of natural variability is within the Lockhart River so that you could determine how sensitive you are to those changes.

But again, we stress that all the predictions are already within, like, the -- what we -- what's shown as those black lines is the range of the data that exists already. So TDS between, say, ten

(10) and forty (40) or -- or fifty-three (53) is the peak measured in the 1990s.

So I think, in summary it's within -- the predictions are within the natural range of data that's been collected to date, but work will be done in -- through the AEMP in conjunction with the Land and Water Board and other parties and -- and the government parties who are monitoring to further develop what is the range of natural variability in the river system.

THE CHAIRPERSON: JoAnne Deneron, Chair of MVEIRB. GNWT...?

MR. ROBERT JENKINS: Thank you, Madam Chair. It's Robert Jenkins, with GNWT. I want to thank Ms. Machtans for -- for that response, and De Beers for answering our questions. That concludes our questioning today. Thank you.

THE CHAIRPERSON: Thank you. At this time, the Board would like to call a break for lunch from 12:00 to 1:15. Thank you.

--- Upon recessing at 12:06 p.m.

--- Upon resuming at 1:27 p.m.

THE CHAIRPERSON: Okay. If we could have everyone's attention and come back to the tables, please, so recon -- we can reconvene the hearing.

(BRIEF PAUSE)

THE CHAIRPERSON: The chair would like to make a couple of introductions. We would like to recognize Kathy Racher, the technical director for -- what is it, for Mackenzie Valley Land and Water Board. And the other introduction is for Cathy McManus, at the back by the door, our receptionist.

At this time we would like to reconvene then with the questions. Next on questions we have Environment Canada to be asking questions. And we have a person on line so we just have to be cognizant of the person on line, that there would be probably a little bit of a delay when a person asks questions. Okay. Environment Canada...?

MS. SARAH-LACEY MCMILLAN: Good afternoon. It's Sarah-Lacey McMillan, and Anita Li on line does have a couple questions.

MS. ANITA LI (BY PHONE): Thank you, Madam Chair. I have a few questions. On slide 3 -- oh, it's Anita Li, from Environment Canada.

On slide 3 the last bullet it says, "Interim EQC," and then I think on page -- I'm trying to find the page here, and it lists -- let's see, page 15. It gives the interim EQC at 850 milligrams per litre, and I -- I don't believe I've seen that interim EQC before.

Is it something new?

MS. ERICA BONHOMME: Erica Bonhomme. We did propose an interim EQC in our response to technical reports. That was filed on May 28th.

MS. ANITA LI (BY PHONE): When you first developed a site-specific water quality objective of 684 milligrams per litre, it equated to an EQC of 684 milligrams per litre, so the site-specific water quality objective was the same as the EQC.

In this case, with the interim EQC are you suggesting that the site-specific water quality objective could possibly be eight-fifty (850) as well within the two (2) years?

MS. ERICA BONHOMME: Erica Bonhomme. No. The site-specific water quality objective that we've proposed for Snap Lake does not change with the application of an interim EQC.

So remember the site-specific water quality objective is a concentration of TDS within Snap Lake that will ensure the protection of aquatic life. An effluent quality criterion is the level of that TDS in the effluent that will ensure that that site-specific water quality objective is not exceeded.

So if we -- we can continue to load TDS -- TDS in mine effluent into Snap Lake without exceeding that site-specific water quality objective in Snap Lake. So what we've proposed is that because there is no mitigation applied at this time, that essentially the effluent would be discharged at -- in a -- in an unmitigated state up to a point where the Snap Lake water quality objective of six eighty-four (684) would be achieved. So that is where that interim EQC comes from.

MS. ANITA LI (BY PHONE): Anita Li, from Environment Canada. Thank you.

So what has changed that between -- I guess, why are you asking for an interim EQC now? Why is it higher than the six eighty-four (684) that you had initially stated in the documents?

MS. ERICA BONHOMME: Erica Bonhomme. This was a discussion -- a fairly lengthy discussion at the technical session. We are responding to some suggestions during the technical session that we look at how -- how we could continue on with this process in the absence of mitigation.

So, as you know, we've presented a

mitigated and an unmitigated scenario. And we've suggested that in the -- while a final site-specific water quality is -- is determined by the Land and Water Board, we will continue with our mining operations.

At this time, we are proposing that an -- an interim effluent quality criter -- cri -- criterion for TDS will allow us to continue in an unmitigated situation for effluent while still ensuring the protection of the aquatic environment in Snap Lake.

MS. ANITA LI (BY PHONE): Anita Li, from Environment Canada. Thank you.

And is this interim EQC, is it the average monthly limit that you're talking about, the 850 milligrams per litre?

MS. ERICA BONHOMME: Erica Bonhomme. That's correct.

MS. ANITA LI (BY PHONE): Another question is: On page 6 of the slide, you've indicated, "The current practices to reduce TDS loading to the environment."

Can you tell me what are the current practices?

(BRIEF PAUSE)

MS. ERICA BONHOMME: Erica Bonhomme. Cur -- the cur -- our current practice to reduce TDS loadings to the environment is through dilution.

MS. ANITA LI (BY PHONE): Anita Li, from Environment Canada. Okay. Thank you. And my last question is on slide 32. I know you've indi -- oh, Anita Li, from Environment Canada.

I know that you've indicated that modelling provides no indication that meromixis will occur during operation and that there's no evidence that Snap Lake is becoming meromitic.

But can you explain how the models tell you that there is no increased -- that the increased TDS would not lead to stratification?

(BRIEF PAUSE)

MS. ERICA BONHOMME: Erica Bonhomme. Alison Snow will respond to that question.

(BRIEF PAUSE)

MS. ALISON SNOW: Alison Snow. The hydrodynamic model that is used to model Snap Lake calculates water density. So as concentrations of total dissolved solids increase in Snap Lake, the model will calculate density. And then we can look at vertical profiles in the water column to see if stratification is being predicted or not.

MS. ANITA LI (BY PHONE): Okay. Thank you. Now, Dr. Chapman had said that during the open water season there's wind mixing the water, so there's no chance of stratification.

What about in the ice covered season? Is there a possibility of stratification?

MS. ALISON SNOW: Alison Snow. So the hydrodynamic model is run daily, so we model both the ice covered season and the open water season. And the hydrodynamic model does not predict stratification occurring during the ice covered season either.

MS. ANITA LI (BY PHONE): Thank you. Anita Li, from Environment Canada. When you say there's no possibility of stratification in the lake, is there -- I guess Dr. Chapman had said the whole lake.

Is there a possibility there could be stratification in parts of Snap Lake?

(BRIEF PAUSE)

MS. ALISON SNOW: Thermal stratification occurs in the open water season in the deep holes in Snap Lake. So there's a deep area in the northwest arm. And there's also a deep location where the diffuser discharges into Snap Lake. But that is not -- the stratification occurring is not based on water density. It's just due to temperature.

So the hydrodynamic model we can look at different locations in the lake. It's not just based on a whole lake average. So we can look at different locations and look at the predicted profiles at those locations. And as I stated, the hydrodynamic model does not predict that stratification will occur.

MS. ANITA LI (BY PHONE): Anita Li, from Environment Canada. You were talking about thermal density. What about the density due to salinity?

MS. ALISON SNOW: Alison Snow. Sorry for the confusion. I'm referring to not only thermal stratification due to temperature, but also stratification that would be caused by density.

MS. ANITA LI (BY PHONE): Anita Li, from Environment Canada. Thank you. That's all my questions.

THE CHAIRPERSON: Any other questions

from Environment Canada?

MS. SARAH-LACEY MCMILLAN: Sarah-Lacey McMillan, with Environment Canada. No further questions.

THE CHAIRPERSON: Thank you. The next set of questions, Yellowknives Dene First Nations?

MR. TODD SLACK: Todd Slack, on behalf of the Yellowknives. And thank you, Madam Chair. I've just got a couple of short ones. The first is a clarification as to what Mr. Whitaker was asking. And if we can just go back to Slide 25?

So bullet number 2 there you suggest that a lower SSWQO may not be achievable. So what exactly can be achieved? Well -- I think that's an important number to -- to set the -- the framework by which we're -- we're considering this.

MS. ERICA BONHOMME: Erica Bonhomme. Theoretically, pretty much anything is achievable. Is it achievable at Snap Lake mine? That's the question we're addressing right now. We are currently evaluating treatment as a feasible technology for what we believe to be a protective site-specific water quality objective of six hundred and eighty-four (684).

MR. TODD SLACK: Thanks for that. I might come back to that in a second.

Just as a -- a starting point for -- for our questions, can you just tell us when mining commenced at Snap Lake and what the planned lifespan of the mine was?

MR. DAVID PUTNAM: Madam Chair, Dave Putnam, with De Beers. We commenced mining in 2008 and the current plan life of mine is 2028.

MR. TODD SLACK: Todd Slack, with the Yellowknives. Thanks.

And at what point did De Beers have data that indicated the TDS loadings were different than those predicted in the environmental assessment?

(BRIEF PAUSE)

MR. DAVID PUTNAM: Madam Chair, Dave Putnam, with De Beers. We first presented the information as part of the proceedings leading up to the water licence renewal in 2011.

MR. TODD SLACK: And would you say that -- sorry, Todd Slack, with the Yellowknives.

Would you say that that presentation was a summary of the data that you'd been collecting over that time? Or was that the -- the first indication that there was deviation from the predictions?

MR. DAVID PUTNAM: Madam Chair, Dave Putnam, De Beers. That was the first time that the -- that the -- the modelling -- the predictive modelling was updated, and so that was the -- the first indication that we had the -- the TDS was trending in a different way than originally predicted.

MR. TODD SLACK: Thanks for that. And so -- Todd Slack, for the Yellowknives. Pardon me.

I -- I'm guessing -- I'm -- I'm a little confused in -- in term -- in terms of what the previous environmental assessment decision said. There was a number of measures contained within that, that if these issues deviated, the project would immediately implement mitigation status.

Now, I understand that you undertook grouting -- a grouting study, which we learned the -- at the technical session was not going to be feasible. However, it seems that there should have been more done at that point in time.

Can you tell us about what you had done previously?

(BRIEF PAUSE)

MS. ERICA BONHOMME: Erica Bonhomme.

Prior to 2011, we commissioned several studies, both of which have been filed -- two (2) studies, both of which have been filed on the registry regarding the feasibility of applying treatment mitigation to Snap Lake Mine with the information available at the time. I should note that since -- since that process -- renewal process in 2011, we've -- we've undertaken a -- and evaluated grouting as a means to reduce TDS loadings.

We've addi -- acquired additional hydrogeological data to reduce our uncertainties in the groundwater model, and as I mentioned, we -- we -- as we've been talking about, we've completed the toxicity testing. We've also updated the BATEA study -- BATEA type studies that we had done prior to that renewal, and that -- that -- those two (2) reports have also been filed with the Review Board here.

MR. TODD SLACK: Thank you. Todd Slack, on behalf of the Yellowknives.

So the study that you -- you just referenced, and then that is on the registry, if the data indicating deviation from the EA predictions wasn't in place until 2011, what exactly was the impetus behind that study in which you undertook and you arrived at this $180 million in terms of capital cost to treat the -- the effluent to the three-fifty (350) limit?

MS. ERICA BONHOMME: Erica Bonhomme. I think that's the first point where we really had comprehensive data from the underground to update our hydrogeological models, and to start evaluating different mean -- ways in which the current TDS loading limits could be achieved. But what's important here is that, you know, you need some -- you need a goal to strive for, and this is where the toxicity studies that we've done are extremely important, because they inform the level of protection that we're striving for.

And there have been many studies done, including ones by Environment Canada on this very issue that have -- to which De Beers has provided input that talk about treatment generally and its applicability to mines, but I think what's very important is the very unique context and conditions at Snap Lake that require a process to be undertaken for us to fully evaluate what options for source control, which include grouting and -- and treatment, that we -- we have a -- a -- the full in -- fullest information we can have before we proceed to fully evaluating their applicability specifically at Snap Lake Mine.

MR. TODD SLACK: Todd Slack, on behalf

of the Yellowknives, and just to wrap this up, so the earliest study that looks at treatment dates from 2008, and the first indication that you had deviation from your predictions dates from 2011.

Do I have that correct?

MR. DAVID PUTNAM: Madam Chair, Dave Putnam, with De Beers.

Yes, the first time we pre -- we presented an updated set of modelling results was in 2011. That was based on having obtained a couple of years of operating experience with the mine, and just to support what Erica Bonhomme has just said, and so really that was -- that was the point where we -- we had enough information about the underground workings of the mine to be able to update the model.

MR. TODD SLACK: Todd Slack, with the Yellowknives.

And, sorry, the second part of that was to clarify that the initial treatment study data from 2008, do I have that right?

MR. DAVID PUTNAM: Madam Chair, Dave Putnam, with De Beers.

The initital -- initial desktop review of potential technologies was done in 2008. It wasn't a -- a full engineering study, but an initial -- an initial review of possible -- possible technologies.

MR. TODD SLACK: Thank you. Todd Slack, on behalf of the Yellowknives.

So I -- I am just at a bit of a loss as to what the impetus behind that 2008 one -- eight (8) -- treatment study was, and what objectives and things were considered within that, if you didn't know that your -- that the predictions were wrong relative to the flows that you were seeing?

Can you help us understand what went into that model, or that modelling exercise, and why there's a -- a discord here?

(BRIEF PAUSE)

MS. ERICA BONHOMME: Erica Bonhomme. I don't have the exact scope of work in front of me for that -- for that. Obviously, to have to -- to check on that for you, but, you know, we -- we do these studies not to just inform, you know, the -- the conditions and the decisions of the day, but, you know, we -- we think ahead to a life of mine planning, and this was an important aspect of -- of understanding the life of mine conditions and what may be required into closure.

Some of those requirements are -- are

contained within our -- our operating licences, and I think that the information there, while now outdated, would have been the best available information at the time. That would have contributed to us evaluating how better to meet our sustainability commitments.

MR. TODD SLACK: Thanks for that. Would it be fair to say that in 2008, that you understook -- undertook that study because you thought you may have a problem with TDS?

THE CHAIRPERSON: Mr. Slack, could you please identify yourself when you speak?

MR. TODD SLACK: My apologies, Madam Chair. It's Todd Slack, on behalf of the Yellowknives. Thank you.

(BRIEF PAUSE)

MR. DAVID PUTNAM: Madam Chair, Dave Putnam, with De Beers.

You may recall in 2008, there was a -- a global recession, and we were just -- just -- I -- I would like to confirm that that was part of -- part of a planning exercise that we did considering, you know, the possibility that we may actually have to close the mine.

So you may recall that we also presented during the water licence renewal, a period in 2009 where we actually stopped production at the mine. So it was a -- it was really an exercise around looking at what we might need to -- to consider in a -- in a closure scenario.

MR. TODD SLACK: Todd Slack, on behalf of the Yellowknives.

I -- I'm just having difficulty understanding why De Beers did this work if they didn't think they had a problem with TDS, global recession notwithstanding. If you did close the mine, would you have had a problem with TDS? It seems that that is the driver behind this, and I'm just looking for confirmation with that.

MS. ERICA BONHOMME: Erica Bonhomme. I -- I think we address all environmental considerations proactively. We're not, you know, saying that there may not have been an issue with TDS down the road. Our latest model predictions that we have confidence in are from 2011, and -- and I -- I think that that is the issue before us here.

We are providing you with information that shows how best we may be able to carry forward and achieve the objectives we've set based on the best available information we have to date, which is models and studies that are dated from 2011 onwards.

MR. TODD SLACK: Madam Chair, Todd Slack, on behalf of the Yellowknives. I'll -- I'll just move on.

I'm wondering if the project has undertaken any research to consider interactive effects between total dissolved solids and other elements or other compounds?

DR. PETER CHAPMAN: Peter Chapman. When we test the total dissolved solids, we're testing all of the components to those total dissolved solids together. So we're not just testing them individually.

Now -- so the research does take that into account. If you look at the literature, total dissolved solids, when this increases, also increases hardness, and hardness can be what CCME in 2007 calls an exposure toxicity modifying factor. In other words, it can change whether something is toxic and bioavail -- bioavailable or not.

And as you know from the record, aside from TDS, we've also suggested for chloride and for nitrate site-specific water quality objectives that are based on hardness as an exposure toxicity modifying factor, which is exactly what was done for Ekati and approved in their water licence. So, yes, we have considered those.

MR. TODD SLACK: Thanks for that answer. It's Todd Slack, with the Yellowknives.

Did you consider in conjunction with metals, you know, let's say cesium, which is shown to be a potential issue, other elements and compounds along those lines that don't form the constituents of TDS itself?

DR. PETER CHAPMAN: Peter Chapman. The -- when you do a scientific study and you look to see what you need to look at, you look -- you identify your contaminants of potential concern. The metals are very, very low levels. They're not something that would have an effect here, particularly as hardness increases, because hardness has been well-shown in the literature to reduce the bioavailibility and toxicity of metals. It's an exposure toxicity modifying factor for metals, as well.

MR. TODD SLACK: Thanks for that. And the only reason I bring this up, because, listen, I don't understand how the synergy and these sort of things, but it was a young Peter Chapman who brought this up at the last hearing and seemed quite concerned about it.

And so I'm wondering if you had recommended this as a -- a potential concern for all of us to be looking at and investigating?

THE CHAIRPERSON: Mr. Slack, please identify yourself when you speak again.

MR. TODD SLACK: I'm sorry.

DR. PETER CHAPMAN: Peter Chapman. I assume that Todd is referring to way, way back when in 2001 when there was the A hearing, and at that time, I was working, not for De Beers, I was working for INAC, subsequently AANDC, now GNWT. And at that point, earl -- before the mine had started working and before we had real data, I raised some concerns and so did -- including a concern that, you know, about the level of TDS.

And at that time I was actually, as a representative of INAC, quite willing to give De Beers the default value of -- of 500 milligrams per litre, because typically although all TDS is not the same, generally as long as you're below five hundred (500) without doing site-specific testing, you're fine.

And that's one (1) of the reasons, I assume, that the Wek'eezhii Land and Water Board gave that default value to Diavik. So yes, I considered those at the time, but it's a very different situation now. We have data from the mine, and I am considering what's happening at this time.

And just to add to this and my previous answer, in terms of mixtures, I just remembered, we do do effluent toxicity mix -- testing. We test with two (2) sensitive organisms. One's a daphnid -- the Ceriodaphnia, the very, very sensitive one that doesn't live in the lake, and the other with an -- with an algae periodically in the effluent and at the edge of the mixing zone, and toxicity testing considers the interactive effects of everything that's there, and in this case, we're doing it in the lake.

MR. TODD SLACK: Todd Slack, on behalf of the Yellowknives.

My last question here is -- I think it's my last question. The project noted that the grouting program is currently ongoing.

I'm just wondering how effective it is at reducing inflows into the mine?

MR. STEVE RIDGE: Steve Ridge, from De Beers.

I'm -- currently we're -- we're looking at -- we are actually grouting for localized high TDS concentrations. As was mentioned before, we looked at putting in a full cork and grout, and deemed that the -

- A) That the technology wasn't there, nor the reliability.

And -- but we are currently -- and -- and we don't have -- we have instances where we can actually show how much the -- the TDS again will reduce if we grout in certain localized areas. However, there's a couple of added complexities if we try and expand that, and namely, okay, first priority for us is the safety of the people who are working underground.

If we continue developing our footwall where we intersect the high connate water and we will have to install a series of bulkheads, and -- and obviously we're -- we're slightly concerned that we're going to build up pressure, and then as we continue mining, then we'll get intersections of that water again.

So we're currently looking at, then, a possible solution for engineering these bulkheads as well as -- and different products that we're going to try for -- for reducing -- for -- for the grouting methods.

MR. TODD SLACK: Todd Slack, on behalf of the Yellowknives.

If I -- I might just indulge one (1) -- one (1) last clarification. So the full curtain grouting program, that started when, I -- I guess is my question? And then when can we expect to have more information as to the amount of inflows that the local curtain grouting will inter -- intercept?

MS. ERICA BONHOMME: One (1) moment, Madam Chair.

(BRIEF PAUSE)

MR. STEVE RIDGE: And Steve Ridge, De Beers.

The -- the localized grouting, we're more concerned with really trying to -- or sorry, I'll take a step back. We have in the last twelve (12) months detailed, okay, mapping of our -- our high TDS sources right down to -- we're trending it on -- on the hour, and we also have a -- we also monitor each face where there's a new intersection of water.

And we measure that with conductivity meters. So what we're able to do is more targets where the high TDS is, and not necessarily where the -- the high flows -- the high flows are. And if we were to give you an example, where we're currently, this week, undergoing a -- a grouting program where we're trying to reduce from 10 milligram per litre in one (1) particular area. But again, it's -- it's more the -- more the quality not the quantity that we can -- that we can measure.

The -- the full curtain, as I say, was -- I think there was -- there was a submission that was -- that was put in there in terms of the work that was done, and -- and our reasons for discounting full curtain grouting.

MR. TODD SLACK: Thank you. Mr. Chair -- or -- or Madam Chair, pardon me, sorry. And thank you for that answer, but I -- I'm looking to just extrapolate when we can expect to see results of the local curting -- curtain efforts, like that research.

So I'm wondering if you can tell us when the -- the full curtain one started, because we know it wrapped up and wasn't going to be effective a few weeks ago.

So how -- can we get the start date on that? And then if you have any information in terms of when we could expect to have good results out of this local curting -- local grouting -- whatever.

MR. STEVE RIDGE: And we have to -- we have to bring up some material, so we've got to fly some cement in. We've got to fly some -- some resin up there. And I would -- best guess at the moment is three (3) months' time that we'll have some sort of indicative figures of what we can -- what reduction we can achieve with the -- with the localized grouting.

Having said that, I just want to stress the point, though. When we look at -- if we do have to construct bulkheads, and that may be further, because obviously, the concern is that we're drilling into the -- the host rock, and where -- where -- while you're putting in a -- a very solid bulkhead, okay, the host rock may not be as competent, and our concern is that we would lose that if we -- if we built up pressure.

THE CHAIRPERSON: Please identify yourself when you're speaking again. Thank you.

MR. TODD SLACK: No further -- Todd Slack, on behalf of the Yellowknives. No further questions. Thank you.

THE CHAIRPERSON: Okay. Thank you. Next questions, Lutsel K'e Dene First Nations.

MR. MIKE TOLLIS: Thank you, Madam Chair. It's Mike Tollis, from the Lutsel K'e Dene First Nation. In your presentation, you mention that there are no national guidelines for total dissolved solids.

Are -- are you aware of the Canadian Drinking Water Quality Aesthetic guideline of 500 milligrams per litre of TDS?

MS. ERICA BONHOMME: Erica Bonhomme. Yes, although I point out those are aesthetic guidelines, not guidelines for the protection of aquatic life.

MR. MIKE TOLLIS: Mike Tollis, from Lutsel K'e. Aesthetic guidelines, I think you reference it in your -- in your presentation that it impacts the taste of the water.

Is that true?

MS. ERICA BONHOMME: Erica Bonhomme. According -- it's -- it's based on a taste panel, a panel of testers. It could, so some people may perceive changes at the levels that have been identified in the drinking water guideline.

MR. MIKE TOLLIS: Mike Tollis, from Lutsel K'e. Thanks for that -- that answer. We just want to make -- make the point that there is a guideline and it does exist, and we don't think that it's unattainable.

Another question is, do you treat your water before it comes out of the taps for your employees at Snap Lake?

(BRIEF PAUSE)

MS. ERICA BONHOMME: Erica Bonhomme. We do add chlorine to the water.

MR. MIKE TOLLIS: Mike Tollis, from Lutsel K'e. Thank you. So in your technical report, when talking about drinking water quality, you state, quote:

"However, the water will remain safe for human consumption. Up to seven hundred (700) people working at the mine rely on Snap Lake water for drinking. De Beers is required to monitor and report on drinking water quality to the territorial health inspector."

End quote. So I just want to make a point here that drinking water quality that you report to the terri -- territorial health inspector is not the same drinking water quality when we say we want to be able to drink the water. We're talking about people who have grown up drinking the water right out of the lakes and rivers, so when we talk about drinking water quality, it's without any treatment, and I just wanted to be clear on that.

And, Madam Chair, that's one (1) of a couple definitions that -- that the community kind of disagrees with the Company on. Another one (1) is overprotective. It was mentioned a couple of times in the presentation and we don't believe that there -- you can be overprotective when we're talking about water quality.

And -- and the same with cumulative effects. It was mentioned a few times that the -- it'll not contribute to cumulative effects, but if you have -- when we look at a -- at a watershed level, if you have -- if -- if Snap Lake contamination is detectable 44 kilometres downstream and Gahcho Kue, for example, is detected 44 kilometres downstream, that's 88 kilometres, and that's -- that's a cumulative effect as far as we're concerned.

I just have one (1) more line of questioning here. I heard a couple of numbers that were -- that were mentioned, and I -- and I read a couple of different ones. So I just wanted to be clear.

How far downstream will the effluent be detectable at the end of the mine life?

MS. ERICA BONHOMME: Erica Bonhomme. Snap Lake effluent will be measurable 44 kilometres downstream of Snap Lake if the site-specific water quality objective of 684 milligrams per litre is applied over life-of-mine.

MR. MIKE TOLLIS: Thank you. Mike Tollis, from Lutsel K'e.

Would you say that this is a conservative -- conservative estimate, or a prediction that's going to be bang-on?

(BRIEF PAUSE)

MS. ERICA BONHOMME: Erica Bonhomme. I -- I think that we consider it to be a reasonable estimate. Our modelling that we've been verifying through ongoing monitoring under the Aquatic Effects Monitoring Program has been very close to the -- the EA predictions we originally had. We have no reason to believe that those predictions will be any different.

I should also point out that as soon as mining stops, the TDS loads to Snap Lake will dramatically decrease, and the water quality will improve almost immediately.

MR. MIKE TOLLIS: Thank you. Mike Tollis, from Lutsel K'e Dene First Nation.

Where is the furthest monitoring station that exists right now downstream from Snap Lake?

MS. ERICA BONHOMME: Erica Bonhomme.

It -- it's at King Lake, and if you look at the -- slide 43 in the presentation we gave this morning, it shows where that station is located in relation to Snap Lake.

MR. MIKE TOLLIS: Mike Tollis, from Lutsel K'e. How far downstream is that from Snap Lake?

MS. ERICA BONHOMME: Erica Bonhomme. My colleagues inform me it's 25 kilometres downstream from Snap Lake.

MR. MIKE TOLLIS: Mike Tollis, from Lutsel K'e Dene First Nation.

How, then, if that's your furthest downstream monitoring station, are you going to be able to detect effluent at the 44 kilometre point at the inlet of MacKay Lake?

MS. ERICA BONHOMME: Erica Bonhomme. That -- that same slide indicates that we will undertake monitoring of water quality at the inlet to MacKay Lake. That is 44 kilometres downstream from Snap Lake, so that's additional monitoring we've committed to undertaking to verify the predictions we've made.

MR. MIKE TOLLIS: Thank you. Mike Tollis, from Lutsel K'e Dene First Nation.

Say, for example, your predications are

inaccurate. How will we be able to know the extent of the effluent if you're not monitoring beyond 44 kilometres?

(BRIEF PAUSE)

MS. ERICA BONHOMME: Erica Bonhomme. We -- when -- our response framework, and -- and we hope that this monitoring will become part of the Aquatic Effects Monitoring Program, when we start to detect changes, we can first of all verify that those are -- those changes are occurring, but then -- and assign a -- assign an appropriate action in response to that.

I should also note, though, that there are -- there is other monitoring being undertaken. As Ms. Machtans pointed out earlier today in -- in her -- her response, other government agencies do conduct monitoring throughout the Lockhart River watershed, and ourselves, as well as everybody else, has access to that information.

MR. MIKE TOLLIS: Thank you. Mike Tollis, from Lutsel K'e Dene First Nation.

There was one (1) slide up there, I -- I'm not sure which number it was, but it -- it showed some of the -- some of the monitoring stations that are monitored by government agencies, and it looked like, if I was reading the map correctly, that the -- the next monitoring station along the Lockhart River was not until Aylmer Lake.

Is that -- is that where the -- the next one after MacKay Lake is?

MS. ERICA BONHOMME: Erica Bonhomme. Actually, if you look at slide 40, again, in the presentation from this morning -- oh, I forgot we had the controls. The yellow dots you see on that map show where the current monitoring stations exist. Not De Beers' monitoring stations; these are government monitoring stations. So you do see several stations within MacKay Lake itself.

MR. MIKE TOLLIS: Mike Tollis, from Lutsel K'e Dene First Nation.

Sorry, I just can't see the -- the yellow dots from here, but I'll -- I'll take your -- take your word for it that they're -- that they're in there.

Yeah, we just wanted to make sure that there's -- there is some baseline data being collected beyond the -- the predicted endpoint for -- for contaminant being detected, you know, in the -- in the case that we're going beyond 44 kilometres.

But thank you, Madam Chair. I think that's all my questions.

THE CHAIRPERSON: Okay. Thank you. Questions from North Slave Metis Alliance?

MR. MATT HOOVER: Thank you, Madam Chair. Matt Hoover, from North Slave Metis Alliance. We have no questions at this time. Thank you.

THE CHAIRPERSON: Thank you. Questions from Deninu K'ue First Nations?

MR. MARC D'ENTREMONT: Thank you, Madam Chairman. It's Marc d'Entremont, here on behalf of the Deninu K'ue First Nation.

I did have a couple questions regarding mitigation, but the previous parties have sort of addressed them already, so I won't repeat them here. But the one I will ask is in regards to management operation.

So, De Beers, in some of the responses you just gave you had indicated that there was a temporary, I guess, stop in production of the mine in 2009. So my question is: Was that a planned stoppage in response to an attempt to maintain compliance with the water licence?

And then, if yes or no, the follow-up to that would be: Have there been other management or operational actions that you've taken to -- in an attempt to maintain compliance with the water licence? Thanks.

(BRIEF PAUSE)

MS. ERICA BONHOMME: Erica Bonhomme. On the -- the first part of your question, the 2009 mine shut -- quote/unquote, "shutdown," was an economic decision.

On the second part of your question, I -- maybe just -- could you be a little bit more specific in your -- in your question, please?

MR. MARC D'ENTREMONT: Marc d'Entremont, for the DKFN. Sure. So I guess the -- the answer I -- I don't want to hear is about mitigation, since that's already been discussed.

What I'm interested in knowing is if there's been management or operational actions, such as either stopping mine production or slowing it or changing certain practices at the mine that would have been implemented as a potential mitigation measure to reduce or to, like I say, stay within compliance of the water licence. Thank you.

MR. STEVE RIDGE: Steve Ridge, from De Beers. And there's a series of -- obviously, as we got better information as to where our -- our high TDS water was coming from, we undertook a complete mapping, okay, of all our reticulation systems. And we're currently ongoing with the segregation plan to try and separate our dirty water from our -- our clean water.

Currently -- I mean, right now, as -- as we speak, we have developed some areas in -- in our footwall which allow us time, okay. So when we -- when we have instances of high TDS intersection and we have a reticulation system where we can divert the water into those areas, okay. And then we -- we can continue to see monitoring from a discharge point.

We've introduced some automation there where we can -- we can see that realtime, or within -- within an hour, and then take the appropriate actions to the undergrounds crews as to -- as to the conductivity levels, and also what actions they must take based on those -- those conductivity levels. We have a -- a detailed program and, I suppose, of communication between the -- the technical services department and also the -- the mining crews and to make sure that there's a -- a level of understanding there, which is -- which is obviously very important. And that communication happens shiftly.

And we also have a -- obviously a cover drilling program. So when we -- before we take a round, okay, with our -- with our drill rigs we go in there and we will take a -- a 13 metre hole, okay, each round in the -- in the footwall development to see if we're going to intersect it. Obviously, if -- if we intersect it, then we can -- we can measure it and then we can -- we can build that into our -- our mine plan whether or not we have to, okay, take any remedial action and -- and prepare for another -- another storage area or whether we have to prepare for grouting.

The other thing that we have done is we've updated our struct -- structural model, which we're waiting for the results of, this year to incorporate to see where -- where -- if we -- if we know the intersections that we're going to hit okay, com -- structure, we can change our -- our mine plan and try and take those strikes more perpendicular to the -- to the falls and then get through them without exposing a larger footprint -- footprint.

MR. MARC D'ENTREMONT: Marc d'Entremont, for the DKFN. Thank you for that answer. It was very helpful. We have no more questions at this time.

Thanks.

THE CHAIRPERSON: Okay. Thank you. Questions from Board staff?

MS. SACHI DESOUZA: Sachi DeSouza, from the Review Board.

There was discussion earlier about the effect of hardness on parameters that was raised by the GNWT. And I understand there's an assumption in the model, and it's a conservative assumption, that says hardness will reduce at the same rates as other TDS parameters.

And my question is: If there's any uncertainty associated with that assumption?

(BRIEF PAUSE)

MS. ERICA BONHOMME: Erica Bonhomme. Alison Snow will answer that question.

(BRIEF PAUSE)

MS. ALISON SNOW: Alison Snow. So for hardness -- we -- we don't model hardness directly. We model calcium and magnesium as constituents of TDS and then we calculate hardness based on calcium and magnesium.

So in the hydrodynamic model of Snap Lake and in the site model, we calibrate it, our model predictions, to monitor data from 2003 to the present. So we have calcium and magnesium and also total dissolved solids calibrated to monitor data. We treat it, total dissolved solids, calcium, and magnesium as conservative parameters during the calibration period.

So we carried that assumption forward into the closure period. So we treated TDS, calcium, and magnesium as conservative constituents.

MS. SACHI DESOUZA: Sachi DeSouza, from the Review Board.

It's -- it's good to know that there is a calibration inserted into the model. My question is this: If there is any uncertainty that remains -- well, if -- because that calibration is for the existing information and your model is simulating future conditions.

So is -- what's the uncertainty with that calibration going into the future?

MS. ALISON SNOW: Alison Snow. We did not quantify, so I can't give you a number in terms of uncertainty, but every model prediction has uncertainty built into it. So in terms of the Snap Lake model, the driv -- the key driver for water quality in Snap Lake is going to be the mine water discharge and the mine water discharge water quality.

So we -- we modelled a range of conditions underground, both in terms of the mine water discharge flow and in terms of TDS water quality. And we expect that our model -- or the actual concentrations in Snap Lake in the future are going to fall somewhere within that range.

MS. SACHI DESOUZA: Sachi DeSouza. Thank you for that. My next question is related to the toxicity testing.

And I understand what's been proposed and the toxi -- there has been two (2) tests put forth before us so far about the toxicity testing. And that testing was done in a lab simulating the water conditions in the lake. And with the theme of uncertainty, once in the environment, the environment is going to be different from the lab conditions.

Is there -- is there any risk or uncertainty associated that those predictions might be a little bit different?

DR. PETER CHAPMAN: Peter Chapman. Testing in the lab is generally recognized as being conservative. By that, I mean it is worst-case testing. There's no chance of avoidance. The animals are in there. The more sensitive that we can make them, for instance, you know, the daphnids are laboratory cultured. They have no chance to get used to what they're put into. They're put into it right away.

So typically we are over-predicting, in terms of what we see. Not always, but typically we're over-predicting in terms of what we see in the laboratory. But that's also why, as I mentioned earlier, we do testing with sensitive organisms, with the sensitive daphnid, with algae and the effluent and at the edge of the mixing zone.

MS. SACHI DESOUZA: Sachi DeSouza, for the Review Board. Thank you. That's -- that's all I have there. I'm going to pass it off to Kathy.

DR. KATHY RACHER: Kathy Racher, for the Board. I just have three (3) or four (4) questions.

My first question is kind of -- I've been trying to -- I've been struggling with how to ask this question. And it's based on the -- the conversation -- the discussion this morning and wanting to get clear on -- on what we're -- what we're talking about.

So -- so normally when -- when someone submits a study or something, evidence to the Board, you know, we don't just read it and go, Oh, that looks okay. You know, we kind of evaluate and try to figure out what the standard for review is. So when you look at something, you think, Well, what is the standard under which I should know whether this is good or bad?

And so when I'm looking at the TDS benchmark study, as it's called, I -- and I'm -- I'm hearing from other parties about the -- didn't use a safety factor as per the -- the protocol for developing water quality guidelines, or didn't use the right number of species as -- as referred to in the resident species procedure for developing a site-specific water quality objective.

And -- and I'm -- you know, just -- I just want to understand what the study was intended to do and, therefore, what the standard of review would be. So, for example, the protocol for the development of a water quality guideline does talk about a safety factor of ten (10) or more, and certain data requirements. But it doesn't say in your benchmark study that you were trying to develop a water quality guide -- a -- a national water quality guideline with your study. So I just find that -- you know, so is that standard of review the right one?

And same -- when I look at the resident species procedure, which GNWT has brought up as -- as what they assume you were trying to do, I see it didn't say it -- it never said you were trying to follow that procedure in the document you submitted as the TDS benchmark study. So I'm not sure if that's the standard of review.

So I just wanted -- if you could tell me in your -- in your own words what you've come up with for us, and what's it based on, and how in your opinion should -- should we review that information?

DR. PETER CHAPMAN: Peter Chapman. Thanks, Kathy, for that question. I'll try and make it simple.

Basically, what we wanted to do -- we started off in April 2011 by presenting people with a drawing, a drawing that showed the food web, very simply, in Snap Lake. It showed that the fish, which we're ultimately trying to protect, depend on the plants in the water, depend on the animals in the water, depend on the animals in the sediment.

So, in other words -- in other words -- so in order to protect the fish, we need to protect not just the fish, but we need to protect the food they depend on. So we're protecting from two (2) types of effects: direct; in other words, the TDS could be at a concentration that would affect the fish, and again, we tested the most sensitive life stage. Could it affect reproduction, or could the TDS affect the food of the fish, so the fish wouldn't have enough food to eat? We spent a fair bit of time consulting and talking to people about this. As I mentioned, we got input from Fisheries and Oceans Canada.

What we were trying to do was do sufficient testing with animals that were found in Snap Lake. Now, the lake trout and the Arctic grayling are certainly found in Snap Lake. In the other cases, they're not the exact species, but the genuses, which is pretty darn close aside from two (2), one (1) of which I can't mention, the copepods -- actually, no, the copepods were in the -- an algae and one (1) of the daphnids.

The genera were there, so we were trying to get as close as we could to giving the best possible information to protect Snap Lake. In doing that, we were well-aware of CCME. And as I mentioned, we're not in a -- away from CCME. What we had thought we'd be able to do in analyzing the data is do what's called a Type A approach, where you do a species sensitivity distribution, and you draw a line from the highest to the lowest to determine what's there.

The problem we face is this data set is so different, because we have so many where it's such a high level we saw no effects, which is reassuring in terms of six eighty-four (684) being protective, which again, is not very far off the five hundred (500), which I mentioned as a default.

So I -- I believe we did that because if you look at the data, I don't believe you need to be a scientist. If you look at the data with honest and open eyes, and you look at it and you say, My goodness, way up here everything is protected by this TDS at this high level, and it's just these daphnids down here that represent a small proportion, I think we've done it. We've made our case.

But, Kathy, I hope that explains. I've probably talked too long as usual. My wife says I talk too long, and I apologize for that, but I hope that explains what we were trying to do.

DR. KATHY RACHER: Kathy Racher for the Board. I -- oh, I won't comment on your wife's opinion about anything.

Okay. I think that -- that is somewhat helpful. I -- I just wanted to clear up though. You -

- you were not trying to develop a national water quality guideline for TDS? This could be a 'yes' or 'no' answer for you, Peter.

DR. PETER CHAPMAN: Peter Chapman. No; however, we are going to publish this as soon as I can get the other two (2) reports out, 'cause I think it's very exciting what was done, and I think it has broad applications at northern work in similar situations, and also elsewhere.

DR. KATHY RACHER: Kathy Racher, for the Board. I told you it was a 'yes' or 'no' answer, but anyway. Okay. My next question.

So given -- so initially, when -- when this was evaluated in the last EA, and we've talked about this, the three fifty (350) was based on the management -- or what you thought was going to happen, not necessarily based on any particular science about protectiveness to aquatic life, for example. But on the basis, you made certain predications in the EA at the time about effects to aquatic life.

And in the -- in the TDS Response Plan, there's a section there that's meant to talk about the ecological implications of the -- of the benchmark, or water quality objective that you came up with for TDS, and in that -- in there, there's a lot of discussion about why the water quality objective is -- is conservative and protective.

But there was no real link to the original EA predictions to help us to know, like, you know, in a -- in both an unmitigated and a mitigated case, what would, you know, what are the -- what are the cur -- what are the predictions now for the effects, say, to zooplankton, since that seems to be the most sensitive species?

DR. PETER CHAPMAN: Peter Chapman here. Going back to the EA, I was -- I was on -- working for INAC at the time, so I wasn't fully involved in what was being done on the EA. I was in a hearing such as this commenting. But basically -- so I can't comment in detail.

But basically, from the EA, expected effects would occur, because with any human development, you're going to have effects, and the question is: Are the effects acceptable or not?

So changes were predicted, that they would occur, but that the changes would occur, shifts in species, some changing back and forth would not affect the food chain that the fish depend upon, okay? And that is still the case with the six eighty-four (684). With the six eighty-four (684), because as I mentioned earlier, copepods, the rotifers, which comprise the main zooplankton compared to the daphnids, very tolerant to TDS. We're not going to see effects that would affect the functioning of Snap Lake.

In other words, the fish will still be there and the food chain on which they depend will still be there. And just be aware that naturally, changes do occur. You can never expect the same species to be there in perpetuity. Things change, but as long as there's, you know, the changes within parameters that the fish can still find the food they need to eat and so on, the lake will still function. That occurs naturally.

This will occur -- there were predictions in the EA, the six eighty-four (684), we should be within the EA predictions. You mentioned the unmitigated case, and you've already heard De Beers say that this is not a reasonable case, because they are going to do mitigation.

However, you also heard me read into the record some comments from EcoMetrix, because both they and we looked at the unmitigated case, and I'm not going to repeat those comments. They're in the record, so hopefully those were enough for you.

DR. KATHY RACHER: Kathy Racher, for

the Board. Okay, thank you. I have two (2) more questions.

One (1) is to just to discuss an apparent inconsistency related to the -- the nitrate water quality objective that was proposed. You've proposed a value of -- I think it's sixteen (16) or sixteen (16) point something based on the protection of aquatic life, and you've made your case for that. That's fine.

But we also recognize that the -- and it's been brought up by other Intervenors, that the -- that the drinking water guideline, the maximum acceptable concentration for nitrate is at 10 milligrams per litre. That's a health-based guideline, and, you know, you've said the -- the water will be safe to drink.

And I'm just -- I'm just wondering why you would propose a -- a water quality objective that's higher than a drinking water guideline for nitrate in Snap Lake?

DR. PETER CHAPMAN: Peter Chapman here. The testing we do -- we did was directed at the ecology. It was directed at the fish and the animals and plants living in the lake. So we developed that scientifically based on that. So that's sitting there.

Then you have the water quality. So you need to put the two (2) together. In the case of nitrate, I fully agree that this is something that you should look at, because the nitrate, you know, is -- is more of an -- much more of an issue potentially for human health than the -- oh, God, sorry. Give me a sec.

Peter Chapman. My apologies. I hate getting old, because sometimes your brain goes kaboom and you sort of forget what you're saying. But we were talking about TDS earlier, and just to use the example of TDS, and Mike, with Lutsel K'e, mentioned TDS in the five hundred (500). Remember, that's an aesthetic guideline. It's a matter of taste. A lot of people will not be able to taste it.

So in that case, you know, I would say that the issue is more ecological than human health. In the case of nitrate, we've got the two (2) together and we've developed one (1) for ecological, but in that case, look at the nitrates, because it's very different than the TDS one.

DR. KATHY RACHER: Kathy Racher, for the Board. Okay, just one (1) more question, and I'm sure it's easy one. We've -- we've heard a lot of numbers, six eighty-four (684), and you've got some new numbers, numbers you're not allowed to talk about, numbers you are allowed to talk about, a lot of numbers.

And we've had a number in the past EA, and there's some discussion whether it's a good idea to have another number in this EA. And I'm just wondering, if the Board wanted to set a narrative water quality objective, do you have an opinion as to what that would sound like based on the work that you've done on TDS toxicity in -- in Snap Lake?

(BRIEF PAUSE)

MS. ERICA BONHOMME: Erica Bonhomme. I just wanted to first add to the other comment that Dr. Chapman made just now, and that's that all the work that we've presented shows that nitrate will not exceed the drinking water quality guideline at the drinking water intake in Snap Lake at any point in mine life. And obviously, as we've pointed out before, after mining stops, it will very quickly decrease, so we have high confidence that the -- that the water will remain safe to drink. On -- on this one ...

(BRIEF PAUSE)

MS. ERICA BONHOMME: One moment, please.

(BRIEF PAUSE)

MS. ERICA BONHOMME: What we are proposing is that we remove the current whole lake objective -- whole -- whole lake limit for TDS of 350 milligrams per litre, and that the Mackenzie Valley Land and Water Board enist -- establish an appropriate and achievable site-specific water quality objective that's based on toxic -- toxicity testing that will ensure that the water remains safe to drink and that the fish remain safe to eat.

(BRIEF PAUSE)

DR. KATHY RACHER: Kathy Racher, for the Board. Okay. I think we understand your opinion on that, and I'm going to direct it to Alan, if that's okay.

MR. ALAN EHRLICH: With your permission, Madam Chair.

The question that I have for De Beers -- it's Alan Ehrlich for the Review Board -- is that you -

- you've made it clear the -- the importance of the ameliorating effect of water hardness on toxicity, that's obviously relevant to what we're looking at here, and put some effort into predicting, as you have, that water hardness will stay proportionate to the contaminants that it's ameliorating the effects of. In other words, that water hardness will not reduce while levels of contaminants are still high.

Now, that's a prediction. And, of course, every prediction has some uncertainty. I vividly remember the last environmental assessment set of hearings, and you know, the best prediction we could make had certain uncertainties in terms of TDS. There were different kinds of uncertainties. One (1) of them had to do with the amount of groundwater, one (1) had to do with the effectiveness of mitigation, one (1) had to do with the concentration of salt in the groundwater.

To build on the question that my colleague asked earlier, I'm interested in what kinds of uncertainties are inherent in the prediction that you have that hardness levels will stay consistent with toxicity levels. I'm not asking the question that you answered earlier, which was to quantify that uncertainty.

I'd like to know what sort of things in the real world were uncertainties that you had to consider inherent in that prediction. Thank you.

MS. ERICA BONHOMME: Erica Bonhomme. We're just going to take a moment here.

(BRIEF PAUSE)

MS. JULIE L'HEUREUX: Julie L'Heureux, from De Beers. So to answer your question, What are the real different thing that could happen, it's -- if we would change our footprint of the mine, because you have to understand that the output of the groundwater models becomes the input for the hydrodynamic models. So the -- the things that could change the footprint of the mine, meaning the percentage of mining under the lake, under the permafrost, the different structures that we could intercept in the future.

So that will decate -- dedicate what could change in the real life.

MR. ALAN EHRLICH: Thank you. My next point is a request for an undertaking. So it's -- it's not a question, although staff do have two (2) more questions. We haven't yet had any compilation of the commitments that De Beers has made in this environmental assessment. In this environmental assessment. I'm not talking about rehashing historical ones.

But, you know, I've seen some relevant stuff in your presentation today, and I'd like to request that De Beers provide as undertaking, which, if it's all right with the Chair, we call Undertaking number 2, provide a -- a complete list of the commitments that you have made on the record regarding the proposed development.

MS. ERICA BONHOMME: Erica Bonhomme. Yes, although I would like some clarification as to some of the due dates for these undertakings, vis-a-vis the schedule we have.

MR. MARK CLIFFE-PHILLIPS: Madam Chair, Mark Cliffe-Phillips, here with the Review Board. June 13th is the date that we have set for the -- the deadline for the undertakings.

MS. ERICA BONHOMME: Erica Bonhomme. Thank you.

--- UNDERTAKING NO. 2: De Beers to provide the Review Board with a complete list of commitments made by De

Beers during this
environmental assessment

MR. ALAN EHRLICH: Thank you. And Madam Chair, with your permission, I'd like to turn it over to Environmental Assessment Officer Simon Toogood for the last questions from staff.

MR. SIMON TOOGOOD: Hello, it's Simon Toogood, with the Review Board. I just had one (1) question with respect to drinking water and traditional use of Snap Lake and downstream.

It seems very clear that De Beers is considering the -- that the water will be safe to drink. I'm wondering how De Beers is considering the aesthetic values of traditional users, or if they are considering aesthetic values of traditional users when considering drinking water standards for Snap Lake and down the stream?

(BRIEF PAUSE)

MS. ERICA BONHOMME: Erica Bonhomme. We have addressed that in various submissions. We do acknowledge that throughout mine operations, there could be a perceived change in the taste of the water at Snap Lake, primarily during operations. That's till 2028.

It would -- that taste of that water would very quickly improve post-closure, so that within four (4) years, it would be below the drinking water guideline of 500 milligrams per litre in Snap Lake.

(BRIEF PAUSE)

MR. SIMON TOOGOOD: Simon Toogood, with the Review Board.

So to be clear, the standards for -- the water quality objectives within Snap Lake and down the stream will not be affected by aesthetic values? De Beers will not adjust those for aesthetic values? That -- you know, there may be guidelines out there, for instance, CCME, and those will not affect the water quality objectives that De Beers is proposing?

Is that a true statement?

MS. ERICA BONHOMME: Erica Bonhomme. I -- I just -- I'll -- I think I'll -- I may respond to your answer by pointing again to the figure which is currently on the screen, I can't recall which page number that is, which shows the extent that the Snap Lake effluent will be measurable downstream from Snap

Lake.

Snap Lake effluent will not be measurable at Lady of the Falls. Snap Lake effluent will be measurable at MacKay Lake, which is 44 kilometres downstream from Snap Lake. Because it's measurable, it will not be within the range of what would be considered above the drinking water quality guideline. We expect those effects to be very localized to this immediate Snap Lake area.

So as a result, not only do we confirm that the water will remain safe to drink, it will also not affect the perceived enjoyment of users in the Snap Lake area for much beyond the operations, which will extend to 2028.

MR. SIMON TOOGOOD: All right. Thank you. Just one (1) follow-up question to that.

There's been some material provided which shows the reduction in TDS after mine closure, but I believe we only have that for the unmitigated scenario, and some of the statements you've made about time for reduction to meet -- to meet drinking water quality guidelines within Snap Lake are provided at a mitigated scenario.

Are you able to provide the graphs or the models to show how TDS and its constituents will decrease over time in post-closure for the mitigated scenario?

MS. ERICA BONHOMME: Erica Bonhomme. You're correct. We did provide that graph, that model, for an unmitigated scenario. We will provide it to you for a -- a mitigated scenario, as well.

MR. SIMON TOOGOOD: Is it all right if we call that Undertaking number 3, or will you be able to get that to us earlier, like today? Is -- okay, we'll take that as Undertaking number 3.

MS. ERICA BONHOMME: Yeah, Erica Bonhomme. No, we would be able to provide that as an undertaking by June 13th.

--- UNDERTAKING NO. 3: De Beers to provide the Review Board with a graph of Total Dissolved Solids (TDS) in Snap Lake for closure and post closure for the scenario that the WQO objective is set at 684 mg/L (the mitigated case)

THE CHAIRPERSON: Okay, questions from counsel?

MR. JOHN DONIHEE: Thank you, Madam Chair. It's John Donihee. I have no questions.

THE CHAIRPERSON: Thank you. Questions from Board members? Yvonne...? Kirby...? Sunny...?

MS. SUNNY MUNROE: No, thank you, Madam Chair, no questions.

THE CHAIRPERSON: James, questions?

MR. JAMES WAH-SHEE: Thank you, Madam Chair. I -- I'd just like to thank the presentation from De Beers and all the questions from the parties, but I have no questions. Thank you.

THE CHAIRPERSON: Questions from Michael? Questions from John Curran?

MR. JOHN CURRAN: Thank you, Madam Chair. No questions at this time.

THE CHAIRPERSON: Okay, with that, I would like to call a break, and right after the break, we'll have the EcoMetrix presentation. So I'll break for fifteen (15) minutes, please.

--- Upon recessing at 2:50 p.m.

--- Upon resuming at 3:13 p.m.

THE CHAIRPERSON: Our next presentation is going to be from EcoMetrix, an independent consultant presentation. We're going to be hearing that now. We have a presenter's table so if I can ask EcoMetrix to get comfortable at the table and present the presentation, please.

(BRIEF PAUSE)

PRESENTATION BY ECOMETRIX:

DR. DON HART: All right. I'm Don Hart, from EcoMetrix. I made my introductory remarks this morning about who I am and why I'm here. I don't think I'll go through all that again.

So on the first slide, you can see my -- my colleagues on this review: Ian Collins, who looked at the -- the modelling work; Mike Venhuis, the geoscientist who looked at the -- the groundwater work; and I've looked at the toxicology and the proposed water quality objectives.

I -- I guess I'll just run though these briefly again. I mentioned this morning the questions that were posed to me as part of the review assessment of the proposed water quality objectives, or the appropriate assessment of the predictions for Snap Lake. Do we have confidence in them, and based on that what's likely to exceed the proposed water quality objectives? And if we -- if those proposed objectives are, in fact, exceeded without mitigation, what would be the -- the potential effects?

I was also asked to comment briefly on mitigation measures, so I'll make a brief comment. We also looked at the EQC calculations. We checked those. I -- I understand those are not the -- the subject of the hearing today, so I've actually removed those from the presentation. This is just a list of the documents reviewed, and again I won't go through that list.

So I'll jump into the assessment of proposed water quality objectives. First and foremost, the total dissolved solids objectives, TDS. This -- this slide has an error on it. I'm sorry, the -- I'm enumerating the toxicity tests that were done. Site-specific toxicity tests mention six (6) species here. In fact, there were eight (8) -- eight (8) species I was aware of, and this morning we heard about copepods, which makes nine (9).

The -- and those species were -- were two (2) alga, which I'm using in a general sense to include the one diatom species; a rotifer; two (2) daphnias; a midge; actually two (2) fish, the lake trout, and I couldn't fit the -- the Arctic grayling in there, but both fish species were looked at.

So this was site-specific toxicity testing using an ion mixture that matches what we -- what we see now and seems to be pretty steady in terms of the dissolved solids mix that's being released into Snap Lake. A good dose response was seen only for the two (2) daphnid species. The lowest IC20, this is the concentration that reduced the reproduction of -- in these species by 20 percent was 684 milligrams per litre. And this was the number selected as the proposed site-specific water quality objective.

The TDS now approaches 300 milligrams per litre in the diffuser area and is predicted to increase. The EAR predicted a maximum whole lake average of 350 milligrams per litre. Current predictions for the lake are as high as 1,700 milligrams per litre for the upper-bound scenario. So that -- that's the -- the background.

Our opinion on this is that selection of the -- the lowest IC20 value among the various site-specific toxicity tests is -- is a reasonable approach. As we heard this morning, we're really trying for a -- a species sensitivity distribution, but most of those species are in fact not responding to TDS within this -- within this test range.

So we have only the -- the two (2)

daphnid species responding. It makes sense to pick the lowest one (1) of those. So -- and we note also that the value of 684 milligrams per litre is in the -- in the range of five hundred (500) to a thousand that has been used for TDS by the State of Alaska for permitting purposes.

Chloride is another important constituent, probably the most important constituent of TDS. It accounts for 45 percent of the -- the TDS in Snap Lake. It's mainly in the form of calcium chloride. The proposed water quality objective for chloride is a hardness-dependent equation. It comes from a publication by Elphick in 2011. And that value is 388 milligrams per litre based on the upper bound of -- of hardness that was investigated by Elphick.

We seem to -- generally, there's a beneficial effect of -- of hardness. It reduces the effect of the chloride, but we see little benefit beyond about 160 milligrams per litre in the Elphick studies. So the chloride effect level at that hardness level was selected.

So 45 percent of the 684 milligrams per litre of TDS comes out to be about 308 milligrams per litre of chloride. What I'm -- what I'm trying to point out here is that the water quality objective for

TDS, the proposed value, will in fact be limiting for chloride.

The chloride water quality objective equation is -- is based on a -- a daphnid effect level versus hardness relationship from Elphick. And this relationship was adjusted down slightly to match the 5th percentile of Elphick's species sensitivity distribution.

So this was accepted as the site-specific water quality objective for the Ekati Mine site in 2013. The CCME water quality guideline is 120 milligrams per litre, so it's a lower number. This was derived also using a species sensitivity distribution approach. The key differences were CCME chose not to do a hardness adjustment. Also, CCME used some species that were quite sensitive, but not in Snap Lake, mussels in particular. So between those two (2) things, it -- these -- a lower national water quality guideline than -- than what's being proposed as a site-specific value for -- for Snap Lake.

Among those test species looked at by CCME was the fingernail clam, with a lowest effect level at 121 milligrams per litre when they used sodium chloride but a much higher effect level, 756 milligrams per litre, when they used calcium chloride. And I think this again is -- is suggesting a hardness effect for -- for this species. This -- this was a life cycle test.

So to make a long story short, the proposed water quality objective for chloride will likely be protective under Snap Lake conditions, and particularly the -- the hardness conditions that obtain in -- in Snap Lake. So we're relying on that hardness effect.

Fluoride is a minor component of TDS in Snap Lake. The proposed water quality objective is 2.46 milligrams per litre. This is the 5th percentile or the low end of a species sensitivity distribution. It's -- it's a value that -- that protects most species.

The CCME water quality guideline, this is an interim guideline, for fluoride is .12 milligrams per litre. It's a much lower value. It was derived from a six (6) day LC50 concentration that kills 50 percent for the caddisfly, so an acute study. And this was divided by a hundredfold safety factor.

So this is a rather crude estimate method. The SSV approach is, in my view, preferred. So the CCME method produces a number which is well below the -- the range of known effect levels.

There are a few effect levels in the literature below the proposed water quality objective. The fingernail clam is a maximum acceptable toxicant concentration calculated as 2.25 milligrams per litre. There was a rainbow trout ten (10) day LC50 in the literature at 2.2 milligrams per litre.

The current prediction for the lake is that it will not exceed 0.5 milligrams per litre, so the current prediction is -- is well below what's being proposed as a water quality objective.

The -- our conclusion here is that the proposed water quality objective is likely protective of -- of aquatic life, at least most species. It's based on a 5th percentile of the species sensitivity distribution. But we know, based on the predictions for the lake, one could easily define a lower target value as a value that could be achieved in order to drive effluent quality criteria.

Now, that's all relative to aquatic life. The maximum accepta -- acceptable concentration for drinking water is 1.5 milligrams per litre. This is the Canadian drinking water guideline. That is based on dental fluorosis. This is a cosmetic effect that we've heard about this morning. It basically affects -- it's a developmental thing. It -- it happens in -- over the developmental period, young children less than about eight (8) years old, and it results in sort of a white spotting on the enamel of the teeth.

So this is the drinking water guideline. Our suggestion is that it seems quite possible to meet this drinking water guideline in the lake based on current predictions. So it might be reasonable to -- to let achievement of that drinking water objective drive EQCs. In particular, that drinking water objective should be met at -- at -- I would say at any location that's regularly used for drinking water intake.

This -- the -- there was a proposed water quality objective for nitrate. Nitrogen is released in the form of ammonium ion and -- and nitrate, oxidized form. Both of these nitrogen species are derived from explosives residue. The proposed water quality objective for nitrate nitrogen is a hardness dependent equation. This comes from work done by Rescan in 2012.

The maximum value from that equation is 16.4 milligrams per litre and this was -- this comes out of the equation at a hardness level of -- of 160 milligrams per litre, which was the -- the highest level where we were seeing protective beneficial effects of -- of hardness.

The nitrate nitrogen equation is based on a 5th percentile of a species sensitivity distribution. And this was adjusted for hardness using a multi-species hardness relationship. This equation was accepted as the site-specific water quality objective for the Ekati Mine site in 2013.

De Beers performed some site-specific toxicity tests on a sensitive species from the Rescan SSDs, species sensitivity distribution, using synthetic Snap Lake water. And they -- they do this at two (2) hardness levels, a hardness of 140 milligrams per litre and a hardness of 350 milligrams per litre in order to confirm that effects -- effect levels being seen using Snap Lake water were above -- at or above the proposed water quality objective.

So in those -- in those tests we saw a lowest effect level of 16.7 milligrams per litre. This was for a daphnid species. The -- so that's just above the proposed water quality objective.

The interesting thing about that is that as we went from 140 milligrams per litre hardness down to 350, we saw the effect level for the sensitive daphnid species declining. And the question I would have is: What happens at higher levels of hardness? And we -- we do have the prediction that hardness levels in Snap Lake could get considerably higher than 350 milligrams per litre.

So the -- and -- and, you know, that -- that question could be resolved by additional toxicity testing at a higher level of hardness to come up with the nitrogen effect level at that higher hardness. In summary, the proposed water quality objective seems to be protective, but we have some uncertainty at the highest hardness levels.

Again, the prediction for Snap Lake is that nitrate may get up to as high as 9 milligrams per litre. So there's -- there's a fair difference between the proposed sixteen point four (16.4) and the predicted nine (9). One could set a -- a lower target level and the like as a -- as a driver for effluent quality criteria. It seems like there would be room to do so.

Again, there is a drinking water criterion, maximum acceptable concentration of 10 milligrams per litre for nitrate nitrogen. This is the Canadian Drinking Water Guideline, and I would say that that guideline ought to be met at any location of drinking water intake. I -- I believe it -- it would be met at the location of the water intake for the Snap Lake Mine. I'm not sure whether there may be other drinking water intakes to be concerned about.

But -- so one could consider, you know, setting a level at -- at 10 milligrams per litre, or -- and -- and below the proposed one and -- and letting that drive the EQCs.

A -- a guideline was proposed for total ammonia. Total ammonia includes the ionized species and the unionized species of ammonia. The unionized forms are more toxic. The proposed water quality objective for total ammonia nitrogen is actually the CCME equation for total ammonia. This depends on the pH and the temperature of the water. It's intended to achieve a level of .019 milligrams per litre of unionized ammonia, $NH3$. So the water quality objective is -- is lower at high pH and high temperature.

The proposal was to evaluate the CCME equation at the 85th percentile of pH and temperature in Snap Lake, so that was a pH of 7.14 and a temperature of 13.7 degrees Celsius. The water quality objective that was proposed was 5.21 milligrams per litre. We checked that calculation using the CCME equation, and using the stated values of pH and temperature. We got a value of 4.6 milligrams per litre as nitrogen.

So as far as I can see, that should be the -- the correct number, but in summary, a -- a proposed water quality objective that equals the -- the CCME equation should be protective of aquatic life.

Again, we can ask the question of what has been predicted for Snap Lake? The maximum predicted is about 2.5 milligrams per litre in the -- the diffuser area, so it should be quite feasible to achieve the CCME guideline for ammonia.

We looked at strontium. This is a -- a very soluble constituent in water. It's chemically similar to calcium. CCME has not defined a water quality guideline for strontium, but one was proposed by De Beers. There are -- there are two (2) reported values in the literature that have been somewhat problematic, which are well below most other values. One was from Birge et al back in 1980, and -- and other was from a study by Borgmann, more recently, using amphipods. The issue with this was that he didn't have a full -- he didn't have a full dose response data set to work with, so his -- his suggested value was greater than something. It was kind of open ended.

So what De Beers did is repeated those two (2) studies in order to obtain more accurate and --

and more complete effect concentrations for those -- for those two (2) species. Those results were combined with other values from the literature, other effect levels, to create a species sensitivity distribution, and again, the -- the low end or the 5th percentile of that distribution was -- was selected as a proposed water quality objective.

Initially, that proposed value was 14.1 milligrams per litre of strontium. However, it seems there were two (2) studies in that data set which were best considered acute studies, according to CCME criteria. Really, what we want is so protect under chronic exposure conditions, so those two (2) studies were removed from the data set. There was a technical memorandum showing the revised proposal, and that revised water quality objective, again, as a 5th percentile of the species sensitivity distribution was 10.7 milligrams per litre.

In -- in our opinion, this water quality objective should -- should be protective of aquatic life. We note that a -- a lower target value in Snap Lake would be possible, and the predicted maximum value is -- is 4 milligrams per litre. So -- and there's a fair bit of room between that and the proposed objective. One could set a lower target.

We looked at -- or a -- an objective was proposed for sulphate. This accounts for 9 percent of the -- of the total dissolved solids in Snap Lake. CCME has not defined a water quality guideline for sulphate. The -- so the proposed water quality objective was taken from the BC Ministry of Environment. BC expressed that guideline as a -- as a step function of hardness. Again, we have a situation where hardness is protective against sulphate effects.

The -- the value for the highest hardness level from BC MOE is two hundred (200) -- 429 milligrams per litre of sulphate, and this work was based on -- on testing done with a rainbow trout embryo model test, and it was selected as a -- a species that was quite sensitive -- a test that was quite sensitive to sulphate effects.

The BC MOE has expressed concern about possible combined effects of hardness and sulphate above the 250 milligram per litre level. MOE has recommended site-specific toxicity testing, testing with site water to determine sulphate effect level in site water if your hardness values are -- are going to be greater than 250 milligrams per litre.

In -- in the case of Snap Lake, the highest hardness levels are, in fact, predicted to be higher than -- than that, and to the best of my knowledge, we haven't seen site-specific toxicity testing specifically focussed on -- on the sulphate effect levels. So again, that -- that could be done.

MOE also made comment about a -- a -- possibly a more sensitive test. Fertilization in pre-eye -- pre-eyed embryos of salmonids may be more sensitive. They -- they expressed that -- that concern. They recommended more research in that area, but generally, they've got a guideline that's based on -- on a -- a sensitive -- a sensitive test. It -- the proposed objective adopting the guideline seems to be protective, but we do have uncertainty about what might go on there for the highest future levels of hardness in Snap Lake.

I'll move on now to talk about the review we did of some of the models that were used ultimately to protect -- to predict substance concentrations in Snap Lake. I'll start with the groundwater flow model, and this was reviewed by Mike Venhuis, who's the geoscientist on our team.

Unanticipated increases in groundwater flows have occurred, and this has prompted a -- an updated flow model to predict future flows through the -- the Snap Lake Mine. This work was done by Itasca, and -- and it's one (1) of the submitted documents.

It used new data -- what am I doing here? It used new data on -- on structure zones and faults on hydraulic conductivity, the measured inflows, and TDS concentrations, and it also used an updated mine plan to build this -- this model. The model was calibrated using measured total dissolved solids and -- and flows.

Our finding was that the model appears to be an appropriate model. There are some limitations with the -- with the -- the data, and I'll highlight a few of those. A full delineation of the Snap and Crackle faults has not been completed. For the modelling, they were assumed to extend to the model boundaries.

Hydraulic conductivities were assigned to different geological layers through calibration to match the measured flows. They're assumed to decrease with depth. My -- my colleague, Mike's, comment here is that no correlation was shown with actual measured hydraulic conductivity, so -- or the assigned con -- conductivities matching with measured values.

The footwall TDS concentrations were assumed to be constant, but measured values seemed to show an increase from 2012 to 2013. We didn't see a --

a comprehensive assessment of trend in -- in this, what would be the -- you know, Is this a real trend, will -- will it extend into the future? So that's an uncertainty.

We note that the final model used an arithmetic mean dissolved solids input, but the geometric mean inputs seemed to give a better correlation of predicted TDS with the recent data. The arithmetic mean would be higher values, so it may have some tendency to overestimate TDS. But overall, the groundwater model appears to accurately represent the current and historical inflows, and to approximate the current and historical TDS concentrations.

Uncertainties associated with the hydraulic parameters of the future mining areas are -- are a -- a data limitation. We -- we don't know these parameters for the future, and measured TDS concentrations for -- for the future are also limitations.

Itasca recommends some further delineation of the Snap and Crackle faults, additional boreholes and hydraulic testing to try and resolve some of those uncertainties as we go along, increased TDS monitoring, and I think the -- the idea is that by collecting data as we go, we'll -- we'll get a -- a good idea of model performance and -- and how well the -- the model is doing and whether it needs any refinement.

I'll next talk about two (2) -- two (2) models that were used to predict concentrations in -- in Snap Lake. First is the -- the mine site model. This collects inputs from various mine sources, including the -- the mine itself in the north pile and the mine site, the -- the water treatment plant, and the water management pond. The mine site model links to the Snap Lake model via inflow of lake water to the mine, and then subsequent effluent discharge of that water back to the lake.

So the -- the two (2) models are run iteratively to allow a mass and flow balance. Key answer, these -- those are mostly related to possible future deviations from the mine plan. If that changes, loadings will change, uncertainties around those groundwater flows that we talked about a few moments ago with respect to the groundwater flow model.

And to me, uncertainty is associated with the -- the model simplification of -- of a -- a rather complex system. In terms of performance in -- in comparing the predictions to recent discharge data, some contaminants were slightly over-predicted in the final discharge, including fluoride, iron, ammonia, and TDS, but overall, there's reasonably good calibration, and the predictions are considered to be either realistic or slightly conservative.

And then the Snap Lake model, this takes the inputs from the mine site model, calculates concentrations in the -- in the -- the lake. It's a -- a three (3) dimensional hydrodynamic model. The input data are meteorological and winds, et cetera, hydrological flows, and chemical inputs the site monitoring data.

The model was calibrated to measure data from 2004 through 2012. After -- after calibrations were -- some over-predictions, including some metals and -- and fluoride, or -- or slight under-predictions. A case -- one (1) case was magnesium.

Again, key uncertainties relate to the upstream models, the future groundwater flows, and -- and possible future deviations from the -- from the mine plan. So overall, a reasonably good calibration in this model. No large under-predictions or over-predictions, at least for the contaminants that will approach or exceed WQOs.

Subject to the key uncertainties mentioned here, we have confidence in the -- the model predictions, in particular, the predictions of TDS and chloride are expected to exceed proposed WQOs in the absence of -- of mitigation.

So without mitigation, the TDS and chloride, as I mentioned, are -- are predicted to exceed proposed water quality objectives as early as 2015 to 2016. What are the likely effects of this in -- in Snap Lake? Excuse me.

(BRIEF PAUSE)

DR. DON HART: The predicted peak concentrations of total dissolved solids are about 1,700 milligrams per litre in Snap Lake for the worst-case scenario. I think there were 820 milligrams per litre, or thereabouts, for the best-case scenario.

For the sensitive daphnids, the Ceriodaphnia dubia in particular, at 1,700 milligrams per litre we would expect more than 50 percent inhibition of -- of reproduction because the IC50 and site-specific toxicity testing was 1,368 milligrams per litre. The predicted peak will exceed that.

So it's likely that there would be, you know, reduced abundance or possibly loss of such sensitive species in Snap Lake, and likely in the downstream Lakes 1 and 2. However, these sensitive daphnids, as -- as noted, have -- have always been a minor component of the invertebrate community. For the other invertebrates tested, the rotifer and midge, we heard or -- or didn't hear this morning was about copepods. The -- and for the fish tested, the lake trout and the -- and -- and the grayling, no effects in tests up to about 1,500 milligrams per litre.

So we're looking at changes in sensitive elements of the zooplankton community. The EAR predicted minor changes in the zooplankton community. I guess the bottom -- bottom line is that we have no evidence at this point to suggest that there would be major community changes. There is some uncertainty in forecasting of community changes. There are species in the lake that have not been subjected to toxicity testing. That's always the case. It's always an uncertainty with this kind of assessment. But the -- it appears that the -- the likely changes would be consistent with those predicted in the EAR.

This slide goes through the same evaluation for chloride. It's really very similar because chloride is -- is one of the main constituents of TDS. Predicted peak concentrations are about 800 milligrams per litre in Snap Lake for the worst-case scenario.

For the -- for sensitive zooplankton species at 800 milligrams per litre, and this is based on -- on Elphick's work and the species sensitivity distribution that -- that he developed, we would expect at least 25 percent of inhibition of -- of reproduction. Probably more, just based on the -- the 5th percentile of Elphick's species sensitivity distribution being 388 milligrams per litre. The -- the eight hundred (800), if -- if realized, would substantially exceed this level.

So what are we looking at? Likely reduced abundance or possibly loss of such sensitive zooplankton species in -- in Snap Lake or in downstream Lakes 1 and 2. Again, these sensitive species are -- are not and have not been dominant elements of the community.

For other taxa it seems like there would be little or no adverse effect. The -- again the EA predicted that there would be minor changes in the zooplankton community, and that -- the evidence we're looking at here seems to be consistent with that as for TDS. We -- we have no evidence to suggest there are more wholesale changes in the -- in the invertebrate community. Again subject to the uncertainties that are always associated with community forecasting, and not all species out there are being tested.

We looked very briefly at the mitigation measures. A mitigation strategy was proposed by De Beers for both TDS and chloride. They included water treatment plant expansion; they included initially segregation of water into sort of clean -- clean and dirty streams, sort of focussed treatment on the -- the dirtier streams. I think we heard in the technical session that -- that this was not going to be feasible most likely.

A mitigation strategy was also proposed for nitrate, including review of blasting pra -- practices, explosives loading and storage practices, and consideration of treatment. So these mitigations are -- as described are quite conceptual. It seems like we're at an early stage in the mitigation planning. They're not described or evaluated really in sufficient detail at this point to judge their effectiveness. Pilot studies are planned and -- and those will hopefully support development of more definite mitigation plans.

We do note that in the alternatives evaluation -- treatment alternatives evaluation report, CH2M Hill suggests that removal effici -- efficiencies greater than 90 percent are possible using reverse osmosis. So based on this, in theory, mitigations to achieve the proposed EQCs should be technically feasible. This doesn't speak to any of the site-specific factors or the economic constraints that -- that may exist in -- in implementing these -- these mitigations. So this is a conceptual assessment really of a conceptual mitigation plan. And that -- that ends my presentation. I'll be happy to address any questions.

THE CHAIRPERSON: Okay. Thank you. We'll now take questions from the GNWT.

QUESTION PERIOD:

MR. DON MACDONALD: Thank you, Madam Chair. Don MacDonald, MESL on behalf of GNWT. We've got a series of questions to pose to Dr. Hart. And I jump around a little bit and probably I go back and look at some of the slides that were presented just so that we'll have some visual perspective on what we're going to talk about. So I -- I just wanted to start with a couple of questions, though, for context.

And the first one (1) is, we had a -- a question that was directed at De Beers a few minutes ago. It related to, you know, whether what we're trying to achieve here relative to the development of a -- a number for TDS was a national water quality guideline or a -- a site-specific objective.

And -- and I just wanted to -- to get clarity also from Dr. Hart about what he thought we were trying to achieve here relative to the number for TDS, or an understanding of the effects of TDS at least.

DR. DON HART: Don Hart, for EcoMetrix. It -- it's my -- my understanding that what we're trying to achieve here is not a national guideline. What we're trying to achieve here is a -- a site-specific objective that will be protective or likely protective of the species that are present in Snap Lake.

MR. DON MACDONALD: Thank you, Madam Chair. Don MacDonald, on behalf of GNWT. So the -- the next question is about CCME recognized that water quality guidelines would not be directly applicable at all sites and there are a certain number of situations that were identified explicitly where water quality objectives were appropriate. And they included such things as for those substances for which water quality guidelines were not yet available from the CCME. They included those situations where water quality objectives could not be achieved for some reason at a site, or those situations where water quality objectives were thought to not be applicable due to unique conditions at the site under consideration.

And so in addition to protocols for the development of national water quality guidelines, the CCME also developed protocols for the development of site-specific water quality objectives. And -- and specifically in 2003 the CCME published the -- what they call the Canadian Water Quality Guidelines For the Protection of Aquatic Life, guidance on site-specific application of water quality guidelines in Canada, procedures for deriving numerical water quality objectives.

And I just wanted to see if Dr. Hart was aware that the CCME had developed nationally applicable procedures for developing water quality objectives.

DR. DON HART: Don Hart, EcoMetrix. I -- I was aware of that document. I -- I have to say I haven't compared what's been done closely with that document, but -- but, yes, I'm aware of it.

MR. DON MACDONALD: Madam Chair, Don MacDonald, on behalf of GNWT. So the follow-up question to that is: This morning we heard De Beers indicate that -- when asked about -- the question about, What do they mean by protective of the environment, they said, really, the water is safe to drink and the fish are safe to eat. I think that was a direct quote if you go back to the -- to the transcripts.

And I think you might agree that those are important considerations. But at least the CCME has identified additional considerations beyond the water being safe to drink and the fish safe to eat, and that is the uses of the water should be protected. And so those are such things as traditional water uses, agricultural water uses, fish and aquatic life. And the way that CCME has -- has established a narrative for derivation of national water quality guidelines and site-specific water quality objectives is that such values should protect all forms of aquatic life and all life stages of those species over long-term exposures.

Dr. Hart, would you agree that that's the narrative intent of the Canadian water quality guidelines? And I understand that you haven't examined the procedures for deriving site-specific water quality objectives so you may not be able to comment on that, but would you agree that that's the narrative intent of the Canadian water qual -- quality guidelines?

DR. DON HART: Don Hart, EcoMetrix. I

-- I believe the -- the intent would be to protect the -- the resident life forms. I don't think that that precludes possible minor effects on -- on some sensitive species. I -- I think that that is inherent in the SSD approach that CCME is now using to calculate even national guidelines.

You can never, I -- I think, guarantee that you've protected all -- all species and all life forms because standard tests don't exist for all those species and -- and life forms. But I think what -- what you can and should do is perform testing on -- on a good selection of representative species in order to -- in order to protect the community that does exist at a particular site.

MR. DON MACDONALD: Madam Chair, thank you. Don MacDonald, GNWT. Thank you for that answer, but that really wasn't the question I asked, and so I'll help you with this. And -- and I'm reading from a document that was published by the Canadian Council of Ministers of the Environment in 2007 entitled, A Protocol for the Derivation of Water Quality Guidelines for the Protection of Aquatic Life, 2007.

And under the CCME guiding principles -- and -- and I'm bringing this to your attention because that's what the question was about -- it states that:

"The guiding principles for the Canada Water Quality Guidelines, freshwater and marine, are as follows.

Guideline are meant to protect all forms of aquatic life and all aspects of aquatic life cycles including the most sensitive life stage of the most sensitive species over long-term -- over the long term from negative effects of anthropogenically altered environmental parameters, for example, pH, temperature, dissolved oxygen, or exposure to substances via the water column."

So that's -- that's a direct quote from the CCME. When I -- when I provide that supplemental information, does that help you remember what the -- the objectives, the narrative objectives of the Canadian Water Quality Guidelines, and the -- by extension, by the way that the protocols for driving site-specific objectives are written, that that is in fact the narrative intent of both water quality guidelines and site-specific water quality objectives in Canada?

DR. DON HART: Don Hart, EcoMetrix. I'll -- I don't have the document in front of me but I'll take your word for it, that -- that those words are in the -- the CCME document, and that that -- that is the -- the intent. The -- I still have to marry that with the -- with the procedure that -- that talks about finding a -- the low end or the 5th percentile of a specie sensitivity distribution.

Using -- using this approach, it's possible that there would be species out there that could show some -- some minor effects, notwithstanding the intent, if we follow CCME procedures.

MR. DON MACDONALD: Madam Chair, Don MacDonald on behalf of GNWT. I'd like now to flip back if we could to the slide -- first slide on nitrate, please, if we could. It should be slide 3 or 4. Yes, good.

Okay. There was something that intrigued me when -- during your presentation as you were talking about the mitigating effect of water hardness on the toxicity of nitrate. And I think many people in this room might understand that as you get more hardness or calcium you get more mitigation of toxicity, but what I heard you say was that is true up to a certain extent, and at some point you get to a level of water hardness above which there is no mitigating effect of hardness on the toxicity of nitrate.

Is that not correct?

DR. DON HART: Don Hart, EcoMetrix. Yes, if you look at the -- the Rescan data, it suggests a levelling off of that ameliorating effect of -- of hardness. And they chose to define that as the maximum hardness level for purposes of -- of accommodating the -- the beneficial effects of hardness.

MR. DON MACDONALD: Madam Chair, Don MacDonald on behalf of GNWT. So if we could -- thank you for that. If we could flip now to the chloride slide, which is I think one (1) back, or one (1) forward. There we go. Thank you.

And -- and I think you've reviewed the underlying data that were used to develop this relationship between water hardness and -- and chloride toxicity.

Is -- is that correct, that -- in part that forms the basis of your conclusion that the proposed water quality objective is likely to be protective of Snap Lake conditions?

DR. DON HART: Don Hart, EcoMetrix. Yes, that's correct.

MR. DON MACDONALD: Thank you. Don MacDonald, on behalf of GNWT. And then what you would have seen then in the Elphick data is -- at least in the public's forum you would have seen three (3) hardness relationships that were presented for different life stages with a single species. But probably you also looked at the underlying data as well in the Resca -- Rescan -- sorry, just in the Elphick report, that showed a fourth data point that also showed either a levelling off or an increasing level of toxicity as water hardness increased.

Is that correct?

DR. DON HART: Don Hart, EcoMetrix. Without having the paper in front of me I -- I'm not sure. It -- it seems to me that -- that Elphick did have some testing done at an even higher level, at 320 milligrams per litre, and that there was some suggestion of the -- the hardness effects of actually lower chloride effect levels at that higher value, yes.

MR. DON MACDONALD: Don MacDonald, on behalf of GNWT. Thank you for that. And so just to refresh your memory, the -- yes, the -- the toxicity did increase and those data were not reported in the final publication, but were -- reported it in the underlying data.

And so what I'm hearing you say, based on this, is that there is a -- a level at which the mitigating effects of calcium, or hardness, on the toxicity of at least nitrate and -- and chloride, there's a -- there's a limit to the extent to which those -- that hardness mitigating factor is actually applicable.

And -- and the fact that there is that limit creates uncertainty in the -- in the associated under -- our understanding of the relationship between the concentrations of these variables, nitrate and chloride, and how -- and the water hardness that we could see over the broad range of conditions without mitigation?

DR. DON HART: Don Hart, EcoMetrix. Was there a question there?

MR. DON MACDONALD: Yeah, I was -- meant to say, And don't you agree with that? And this is Don MacDonald again.

DR. DON HART: Don Hart, EcoMetrix. Yes, I think I -- I would agree that for the high hardness levels there is -- there is some uncertainty about -- about what goes on there and the interplay between -- between the hardness and the -- the toxicant effect.

MR. DON MACDONALD: Thank you. Don MacDonald, on behalf of GNWT. I'm -- I'd like to now move onto the slide for fluoride. So here we see a proposed -- here I'm perplexed, honestly, about this slide. And so I'm -- I'm hoping you're going to help me understand what's on here.

So what I think I see is a proposed water quality objective of 2.46 milligrams per litre of fluoride that was calculated using species sensitivity distribution. And then I see towards the end a statement that:

"The proposed water quality objective is likely protective of aquatic life."

But then in the fourth bullet I'm looking at these data for rainbow trout which show a ten (10) day lethal concentration of -- it's an LC50 there of two point two (2.2) which is below the proposed water quality objective. And -- and for -- for me, that -- that's a -- well, an LC50 is the concentration of fluoride that would be associated with a 50 percent mortality of rainbow trout in a ten (10) day toxicity test.

First of all, can I -- can I confirm that that's what that means?

DR. DON HART: Don Hart, EcoMetrix. Yes, ten (10) day -- ten (10) day LC50 is a -- a concentration lethal to 50 percent of organisms over a ten (10) day exposure period.

MR. DON MACDONALD: And this is Don MacDonald again on behalf of GNWT. And -- and my understanding is that Snap Lake has resident salmonid species present.

Isn't that correct?

DR. DON HART: Don Hart, EcoMetrix. That's correct.

MR. DON MACDONALD: Thank you for that answer. Don MacDonald, on behalf of GNWT. So what I'm really struggling with here is trying to understand how a water quality objective of two point four-six (2.46), which is higher than a ten (10) day LC50 of 2.2 milligrams per litre, would be protective of aquatic life in Snap Lake.

I'm wondering if you could explain that to us.

DR. DON HART: Don Hart, EcoMetrix. As -- as I recall, this particular value, the rainbow trout value, was deemed -- deemed a sub-chronic study and not included in the -- in the SSD. I think what -- what I'm trying to point out here is that right around this proposed level of two point four-six (2.46) we -- we do have some uncertainty and some reported effect levels, anyway, that are slightly lower.

And to me, this -- this suggests that we may not wish to go with exactly two point four-six (2.46), but -- but something lower. And it -- it's -- it's clear from the predictions for Snap Lake that there's -- there's room to go somewhat lower.

MR. DON MACDONALD: Thank you for that. Don MacDonald, on behalf of GNWT. I appreciate you helping us to try to understand that recommendation. So in your -- and -- and in a number of places, you've indicated that -- that there are a number -- and this is a paraphrase and you'll fix it if -- I'm sure, if it's wrong.

But the way I understood your comment was that there are -- it was in Snap Lake, there are a large number of species that could be adversely affected by changes in water quality conditions. We have a limited number of tests for which we have generated toxicity data. And so we're left with some unresolved level of uncertainty about what the potential effects of changes in water quality could be.

Is -- is that not close to what I think I heard you say?

DR. DON HART: Don Hart, EcoMetrix. Ye -- yes, I think that's -- that's the -- the essence of the answer, indeed, that I was trying to point out. We -- we always have this kind of uncertainty in trying to predict effects in -- in communities. You very seldom have toxicity test data for all of the resident species, in -- in particular because test protocols for all those species don't exist. So you try to pick a collection of surrogate species that you feel are representative of the community that -- as a whole that's out there.

MR. DON MACDONALD: Thank you. Don MacDonald, GNWT. I think that's -- that's really helpful. And I think what -- what I get from that is that -- that there is residual uncertainty in our understanding of what the effects of changes in water quality are likely to be.

And -- and I think you've really hit on the reason why the CCME has established these nationally applicable protocols and procedures for driving, not just water quality guidelines, but site-specific water quality objectives. It's really to make sure that we have minimum data requirements as we move through this process so that we can -- minimum data requirements so as we move through the process, we have at least a minimum understanding of the -- the types and level of effects that can be expected at certain kinds of concentrations.

But also, the CCME has established their -- in their procedures for use of safety factors to explicitly account for this uncertainty that we have. And -- and that's what's really missing from the work that's been done by De Beers here.

Now, I know my colleagues in the back have only two (2) additional questions. And so I would pass it to...

THE CHAIRPERSON: I would like just to remind the GNWT that if we could be question specific, please, so we could try to stay on track. Thank you.

MR. RICK WALBOURNE: Thank you, Madam Chair. It's Rick Walbourne, with ENR. Dr. Hart, you referenced De Beers's default value of 500 to 1,000 milligrams a litre of TDS based on guidelines that were developed in Alaska.

Can you clarify if Alaska's guidelines were developed with the water of a similar ionic composition to that of Snap Lake, and by that I mean chloride-dominated water that we see in Snap Lake? Thank you.

DR. DON HART: Don Hart, EcoMetrix.

What Alaska has defined is a range within which they will make site-specific determinations about an appropriate level of -- of TDS. So below five hundred (500), they're -- they're pretty comfortable. Above five (500) they want to see some site-specific information. So they would be considering site-specific factors when they're within that five hundred (500) to a thousand range.

MR. RICK WALBOURNE: Thanks for that. Rick Walbourne, ENR. Just to clarify on that, I note the studies that were conducted to determine -- to arrive at the 500 milligrams a litre, the studies that were done in Alaska, can you confirm that those studies were done on waters that were similar in nature to the waters at Snap Lake in ionic composition?

And by that, I mean were chloride-dominated waters used in the studies that were used to develop the Alaskan guidelines?

DR. DON HART: Don Hart, EcoMetrix. I -- I don't think I can speak at this time to the details of the development of the -- of the Alaska guidelines. What I'm giving you is my -- my interpretation of how those guidelines are -- are applied.

MR. RICK WALBOURNE: Thanks for that.

One (1) follow-up question. It's our understanding that actually calcium-dominated waters were used in Alaska to develop those guidelines.

Can you comment then on the relevance of those Alaskan guidelines to the Snap Lake site based on those differences in ionic composition, specifically, a chloride-dominated Snap Lake situation versus a calcium-dominated water used in developing the Alaskan guidelines? Thanks.

DR. DON HART: Don Hart, EcoMetrix. From what you told me, I'm not sure what the anion was associated with calcium. It seems like that would be important. So I'm not sure if I understand your -- your question. But wou -- would they have been looking at data sets with the exact ionic composition of Snap Lake? Most likely not.

MR. RICK WALBOURNE: Thanks for that. Rick Walbourne, ENR. Yeah, thanks for that, Dr. Hart. Just to clarify, I guess, it's that it's know that TD -- the driving toxicity factor in TDS is usually based on the constituents that make up the TDS. And in the Snap Lake situation, we feel that chlorides may be the -- the driving factor in toxicity as opposed to, I think, calcium and sulfates, is my understanding, for the Alaskan guidelines.

I just want to -- your thoughts on this, if there could be any certainty in using those Alaskan guidelines at Snap Lake based on that information?

DR. DON HART: Don Hart, EcoMetrix. It seems to me that -- that the -- the range within which Alaska decided that they were comfortable with less than five hundred (500) and wanting to look at site-specific factors in the five hundred (500) to a thousand range, that principle seems to me to be -- to be applicable. I -- I -- it's -- it's been a long time since I've looked at the Alaska guideline. I can't recall exactly what data they were looking at and how that evolved into their -- into their procedure.

But if you're asking what -- could there be differences between a calcium sulphate dominated system, calcium chloride dominated system, yes, there could be.

MR. RICK WALBOURNE: Thanks for that. Rick Walbourne, ENR. I'm going to pass it over to my colleague, Sean Whitaker, for I think one (1) final question, if that's okay?

MR. SEAN WHITAKER: Thank you, Madam Chair. This is -- one (1) final question. Sean Whitaker, from ENR. Dr. Hart, I have a question regarding the modelling -- the forward predicted modelling for closure.

As was stated earlier today by De Beers, they did not include conservative parameters that may remain in the system at closure and that if hardness were to be reduced at an accelerated rate, is there a concern that the ameliorating factor up to a certain level of hardness that we've just previously indicated, once that drops, is there potential for a condition that may affect the future population of Snap Lake in the post closure period?

DR. DON HART: Don Hart, EcoMetrix. In -- in general, if you are to leave toxicants in the system after the hard -- the hardness goes away that was having a protective effect, then, yes, that's -- that's an issue and it obviously negates your dependence on -- on that protective effect of -- of hardness.

In the case of the TDS constituents that we've been talking about today, I don't see that that's the case. I -- I would -- I don't see how they would remain in the system after the hardness goes away.

MR. SEAN WHITAKER: Thank you, Madam Chair. Sean Whitaker, with ENR. Just one (1) final follow-up. Dr. Hart, if it was metalloids and nitrate that remained cycling in the system, not specifically the TDS concentration, because the TDS is what's allowing the hardness to increase, but if the metalloids and nitrates were remaining in the system in the post-closure period, would that be an issue?

DR. DON HART: Don Hart, EcoMetrix. Let's deal with them one at a time. The -- if you were to leave the nitrates in the system after the hardness goes away, then that could be an issue with -- with application of a guideline that depends on that hardness, the protective effect of hardness.

I'm not sure what metalloids you're talking about there, but my impression is that in general the metals and -- and metalloids are not really issues at -- at this site. They don't seem to be approaching CCME water quality guidelines, for example.

THE CHAIRPERSON: We'll ask for questions then from Environment Canada.

MS. SARAH-LACEY MCMILLAN: It's Sarah-Lacey with Environment Canada, and Anita's on the phone and she has some questions.

MS. ANITA LI (BY PHONE): With the -- the slide on chloride, Dr. Hart, you mentioned that there was low benefit beyond the hardness of 160 milligrams per litre.

What do you mean by that?

DR. DON HART: Don Hart, EcoMetrix. When you look at Elphick's data, he tested at a number of different hardness levels. And beyond a 160 milligrams per litre, I think his next highest level was three hundred and twenty (320). He really wasn't seeing a -- a beneficial effect of hardness. In fact, he was sometimes seeing a -- a lower chloride value than at -- at the one-sixty (160). So his feeling was that -- that he shouldn't be claiming a hardness benefit at levels higher than one-sixty (160). That -- that the benefit would -- would stop there.

MS. ANITA LI (BY PHONE): Anita Li, from Environment Canada. Thank you. The next question I have is when you talked about fluoride you mentioned that the SSD method was preferred by EcoMetrix and that divided by a safety factor is a crude method.

So I'm wondering if you have seen other clients who have developed site-specific water quality objectives using a -- a safety factor.

DR. DON HART: Don Hart, EcoMetrix. I don't know if I want to talk about other clients, but -- but certainly water quality guidelines with -- have been developed with safety factors. The CCME values used to be mostly of that nature. In -- in their 2007 protocol they -- they've indicated that they prefer the -- the SSD method. But certainly the low effect level times the safety factor approach has been used and -- and is still sometimes used in cases where there's insufficient data for an SSD approach.

MS. ANITA LI (BY PHONE): De Beers is proposing to use a safety factor of one point zero (1.0). I was wondering if you could comment on that.

It's -- I guess I'm wondering is that commonly used, a safety factor of one point zero (1.0)? And I guess is it useful?

DR. DON HART: Don Hart, EcoMetrix. Well, a -- a safety factor one point zero (1.0) obviously doesn't do anything. I -- I think what use of a factor like that is really saying is that -- that we don't have any uncertainty that we feel needs to be compensated by use of a -- of a safety factor. I take it you're referring to the -- the use of a -- well, to -- to the lack of a safety factor in the -- the derivation of the proposed value for -- for TDS.

I -- I guess my view on -- on that would be if we only had the two (2) pieces of data from the two (2) daphnid species that gave us EC20 concentrations then we would have a limited data set that would certainly warrant use of a safety factor.

In this case we have eight (8), or nine (9) if you include the copepod species that -- that were tested, really with the intent of a -- an SSD approach.

I guess I'd suggest that -- that that testing, even though the organisms gave no response, that's information. And that -- it helps us understand that what we're looking at in the two (2) responsive species are -- are two (2) rather sensitive organisms. And it seems to me reasonable under that condition to sort of choose the lowest -- the lowest of those species values with -- without a safety factor. Because you have this other set of data where adverse effects were not seen that is telling you something.

MS. ANITA LI (BY PHONE): Thank you very much. I have one (1) final question, and that is the slide on sulphate. You -- in one (1) of the bullets, it said:

"Concern about combined effects at hardness above two-fifty (250) MO -- MOE -- [BC MOE, I guess] -- recommends toxicity testing with site water if hardness is greater

than two-fifty
(250)."

So I was wondering, what was the concern that the MOE was talking about to sulphate?

DR. DON HART: Don Hart, EcoMetrix. They seem to be concerned about the combined effects of the hardness and the sulphate, and I believe they talked about possible osmotic effects. That was -- that was their concern.

MS. ANITA LI (BY PHONE): All right. Thank you very much. Anita Li, from Environment Canada. That's all the questions I have.

THE CHAIRPERSON: Thank you. We'll now ask questions from Yellowknives Dene First Nation.

MR. TODD SLACK: Thank you, Madam Chair. Todd Slack, on behalf of the Yellowknives. I just have one (1) question.

When I reviewed the Health Canada guideline for -- the aesthetic guideline of 500 milligrams per litre, it was my sense that that was based on the TDS issue of -- that was -- in which the TDS, which we know is complex, was principally composed of carbonates.

So in this case where we have a principal component that's chlorides, I'm wondering if you have any experience or any knowledge that you can provide that would help us understand whether we can expect to see a better or worse case, or if there's any information that you can provide for the -- the Board here?

DR. DON HART: Don Hart, EcoMetrix. No, I really haven't looked into that. I don't think I could give you information that would resolve that for you.

MR. TODD SLACK: Todd Slack, with the Yellowknives. No questions. Thank you.

THE CHAIRPERSON: We'll ask Lutsel K'e Dene First Nation for questions.

MR. MIKE TOLLIS: Thank you, Madam Chair. Mike Tollis, from Lutsel K'e Dene First Nation. I want to thank Dr. Hart for that presentation, but we have no questions. Thanks.

THE CHAIRPERSON: Questions from North Slave Metis Alliance?

MR. MATT HOOVER: Thank you, Madam Chair. Matt Hoover, North Slave Metis Alliance. Thank you for your presentation, Dr. Hart. I just have a couple quick questions.

You recognize that there is uncertainty with predicting TDS and the water quality objectives for TDS of six eighty-four (684) will be limiting for chloride, so forgive me if this is something that's already understood by most people, but this assumes that chloride is 45 percent of the TDS.

However, did you consider the potential for connate water to vary in this composition, and can you elaborate on this for me, please?

DR. DON HART: Don Hart, EcoMetrix. In -- in doing that calculation, obviously I used the 45 percent. If the connate water were -- were to change resulting in a different composition of TDS being released to Snap Lake, then the situation as regards to TDS and chloride might, in fact, change. It -- it seems, from the data presented by De Beers, that the ion composition has been pretty steady for the last number of years.

But yes, if it changes, then it's a new ball game.

MR. MATT HOOVER: Thank you. Thank you. Sorry, I'm having some issues with this microphone. This is Matt Hoover, North Slave Metis Alliance.

Related to that, I have another question is that as of the technical working group for Snap Lake that just occurred this past week, De Beers made it aware that they do not have a calibrated chloride meter on the discharge pipe that's been -- the chloride meter has been installed since 2013.

Would you say this is a concern for monitoring and mitigation at site? Thank you.

MR. DON HART: Don Hart, EcoMetrix. I -- I would say that if you're using a -- a meter of any kind, it should be calibrated, yes.

(BRIEF PAUSE)

MR. MATT HOOVER: Thank you. Sorry, I just have one (1) more question. I'm just finding it, here.

(BRIEF PAUSE)

MR. MATT HOOVER: You noted in your presentation that mitigations are not described or evaluated in sufficient detail to judge their effectiveness.

Was this not concerning to you, and would you identify this as a gap, perhaps, that needs to be addressed? Thank you.

DR. DON HART: Don Hart, EcoMetrix. I

-- I think we'd all have been happy if we could see a -- a detailed plan for mitigation and -- and better judge its effectiveness at this -- at the -- this point in time. So is it of -- of concern?

Yes, but I imagine that the -- as the pilot studies progress, hopefully quickly, that issue will be resolved. I know it does create a bit of a -- a bit of dilemma not -- not knowing the answer at this point in time.

Does that answer your question?

MR. MATT HOOVER: Matt Hoover, North Slave Metis Alliance. Yes, that answers my question. Thank you very much. That's the end of my questions. Thank you, Madam Chair.

THE CHAIRPERSON: Questions from Deninu K'ue First Nations?

MR. MARC D'ENTREMONT: Thank you, Madam Chair. It's Marc d'Entremont, with the DKFN. Thank you, Dr. Hart, for that presentation. I just have one (1) question. So in your presentation, you mentioned uncertainty a number of times regarding the total dissolved solid components as well as the -- the various models that were used.

So this is one (1) example. Under the mine site model slide, you mentioned uncertainty related to the factor -- the fact that it was simplified model used on a complex system.

So in the interests of adaptive management, which is essentially in place to address kind of uncertainty, what would you recommend in terms of, I guess, future modifications to the model that would lower the level of uncertainty in this case? Thanks.

DR. DON HART: Don Hart, EcoMetrix. I think in most models, we're -- we're taking a -- a complex system and making it simpler for the purposes of modelling. I'm not suggesting that there's anything wrong in that, or that it needs to -- to be fixed. I think our -- our feeling with respect to the mine site model that -- is that it was pretty well done, and it's the -- the big uncertainties are the upstream models, the groundwater flows. And -- and, of course, anything changing in the mine plan could -- could substantially change loadings.

MR. MARC D'ENTREMONT: Marc d'Entremont, for the DKFN. All right, thank you for that answer. We have no more further questions.

THE CHAIRPERSON: Questions from De Beers?

MS. ERICA BONHOMME: Erica Bonhomme.

We do have a few questions. We'll start with Dr. Chapman.

DR. PETER CHAPMAN: Peter Chapman. Don, I'd just like to take you back to some discussion you had with the GNWT, where you talked about the Alaska TDS, total dissolved solid range from five hundred (500) to a thousand, and they pointed out to you that this -- the Alaska one was dominated by calcium. You noted in your reply that calcium is a cation.

Why is that important?

DR. DON HART: Don Hart, EcoMetrix. I guess in my reply, I was trying to elicit or recall what -- what the anion was in the -- in the Alaska work. Why is the cation important? The -- the calcium cation is a -- a major constituent of hardness. The -- the -- so the -- you know, calcium as opposed to sodium, for example, would likely give you -- give you different -- different results.

It -- I'm not sure if I'm answering your question.

DR. PETER CHAPMAN: It's Peter Chapman. Let me try it another way.

Would you agree that total dissolved solids is made up of cations and anions? And that chloride, in fact, is an anion. So you can't say -- calcium is not the same as chloride. It's an anion.

Is that correct?

DR. DON HART: Don Hart, EcoMetrix. I'm getting a bit confused here. Of -- of course calcium is not the same as chloride. Chloride is your anion and calcium is -- is the cation.

DR. PETER CHAPMAN: Okay. Peter Chapman. I apologize if I'm being confusing.

I'm just wondering then, just to finally do this, if you had a chance to look at slide 18 of the GNWT presentation, which we still have to see but it was sent out, 'cause it's interesting, on that slide it quotes Wetzel 1993 talking about salinity TDS, in other words, in fresh water lake, being dominated by both cations. And it mentioned calcium, magnesium, potassium, and sodium, and also anions. And it specifically mentions freshwater lakes as being dominated by anions, including chloride.

THE CHAIRPERSON: Again, could I just ask members to be question specific.

DR. DON HART: I'm not sure what the question was.

DR. PETER CHAPMAN: Peter Chapman here. What I'm trying to get at is basically the TDS is composed of both anions and cations, and we want to make sure we don't confuse apples and oranges. So I apologize, I probably was asking the questions in the totally wrong way, and I apologize for that.

All I want to get on the record is that we need to look at both forms because there's both the positive and the negative charged ions in there, and I wanted to point out that, you know, when we're talking about the Alaska ones we can't just look at one (1) side of the equation, the positive. We have to look at the negative as well.

Would you -- would you agree with that, Don?

DR. DON HART: Don Hart, EcoMetrix. Now that I understand the question, yes, I'd agree.

DR. PETER CHAPMAN: I do -- Peter Chapman. I do apologize. I have some very simple questions now, I promise you.

Do we have any evidence that very high water hardness for nitrate and chloride is not protective?

DR. DON HART: Don Hart, EcoMetrix. No, I don't think we -- we have that evidence. The -- in the Elphick studies there was -- there -- some indication of lower effect levels at three twenty (320) versus one sixty (160).

But really in terms of the -- the highest hardness levels that are predicted for Snap Lake, no, I don't think we have evidence that they're not protective. I -- I guess what I was trying to put on the table is -- is some uncertainty at that end of the hardness spectrum.

DR. PETER CHAPMAN: Peter Chapman. Thank you for that answer. Two (2) last questions.

I just wanted to confirm that the Elphick et al 2011 paper on chloride and hardness relationship that Ekati and ourselves have used as the basis for developing site-specific water quality objectives for chloride was published in a peer-reviewed international journal?

DR. DON HART: Don Hart, EcoMetrix. Yes, it was.

DR. PETER CHAPMAN: Peter Chapman. One (1) last question and I'll turn it over to Erica.

Don, are you aware whether the Mackenzie Valley Land and Water Board water and effluent quality management policy specifically requires the use of CCME guidelines to develop site-specific water quality objectives?

DR. DON HART: Don Hart, EcoMetrix. My

recollection is that, no, it does not.

DR. PETER CHAPMAN: Peter Chapman. Thank you very much. Masi. I'll turn it over to Erica.

MS. ERICA BONHOMME: Erica Bonhomme. This follows on a question that Mr. Hoover posted to you.

In your view, is the identification of mitigation a necessary part of the process to establish a site-specific water quality objective?

DR. DON HART: Don Hart, EcoMetrix. No, understanding the mitigation is not really part of deriving the site-specific water quality objective. I -- I think what we all want to have a comfort level with is whether there's going to be mitigation feasible to achieve the water quality objective that has been derived.

MS. ERICA BONHOMME: No further questions.

THE CHAIRPERSON: Okay. Thank you. Questions from Board staff?

DR. KATHY RACHER: Kathy Racher, for the Board. I just have two (2) questions, you'll be happy to know.

One (1) is a -- a clarification on the

question asked by the GNWT. They asked you -- it was about the conservative -- which -- which ions are conservative in terms of will they dilute at the same rate as hardness would dilute post-closure for example.

And the way the question was -- the second question on that was posed was: If you were to leave nitrate or metals in the system then would you still have the amelior -- you know, a different -- the amel -- and but the hardness went down, would that be a problem. And I think in your answer you said, No, if you were to leave nitrate in the system, that would be a problem. But I'm not -- I don't know if it -- it was meant to be said that way. I don't know if there's any evidence that nitrate would -- would stick around for some reason.

Is -- is that what you're saying, that it would stick around or -- or were you -- were you not clear on the question?

DR. DON HART: Don Hart, EcoMetrix. I -- I think the notion that it might stay around was inherent in the question that I was trying to answer. I'm not aware that -- that it would. I would expect it to go away in the same time scale as the hardness.

DR. KATHY RACHER: Kathy Racher, for the Board. Thank you for that clarification.

My only other question is the analysis that you did for the Board on the potential effects of the exceedances of water quality objectives for TDS and -- and chloride were sort of based on the unmitigated case which was good to -- to know how you thought that shook out.

And I guess I just -- I just wanted to -- I don't know how much you can say about it, but if you can tell us what can we expect for changes in Snap Lake if, for example, this value of six eighty-four (684) is a -- is an acc -- is an accurate as value for a lowest effect level for -- for the most sensitive species in Snap Lake.

What could we expect in terms of effects overall to Snap Lake or the ecology of Snap Lake?

DR. DON HART: Don Hart, EcoMetrix. Sorry, are you asking me to imagine if we achieved the six eighty-four (684) and the six eighty-four (684) is accurate? Or did you say inaccurate?

DR. KATHY RACHER: Kathy Racher, for the Board. I -- I'm just at the end of the day and I'm poorly wording everything.

What I meant was, let's assume that it's accurate in terms of the lowest effect level measured at this time and Snap Lake goes up to that value. And

I just want to know -- like because at that value there's some measured effect on a species. And -- and I think the GNWT has -- has pointed out that there are -- are -- there are potential effects to other species as well, lower effects at that level as well.

So I'm wondering if the lake was to go that level of six eighty-four (684) what -- what would we expect in terms of effects to the overall ecology or to zooplankton? Because you gave us -- you gave us a case of what would be the effects if the unmitigated case so I just wanted to -- to know what it was at the mitigated case. And I understand that in your answer here you can only speak to the effects of TDS and not everything else in the whole world, so.

DR. DON HART: Okay. Don Hart, EcoMetrix. Yeah, so if -- if we achieve the proposed objective level of six eighty-four (684) and based on the toxicity test information that's been put in front of us that would correspond to a level that has a low level of effect on a sensitive zooplankton species, in particular Daphnia magna. So it would have been a 20 percent reduction in reproduction for that species.

So what would be the outcome of that? This is -- this is a -- a marginal effect. A 20 percent response level is typically just at the threshold of what you can significantly measure. It -- it may or may not, but it could have the potential to lead to reduced populations as a result of the reduced reproductive output.

As I said, 20 percent is -- is a pretty low level of effect, so any species can compensate for that level of effect.

(BRIEF PAUSE)

THE CHAIRPERSON: Questions from counsel? Questions from Board members? Yvonne...?

MS. YVONNE DOOLITTLE: Yes, hello. This is Yvonne Doolittle, Board member.

One (1) of your -- I guess just to sum it up, because it has been a long day, so you -- your assessment of the EQC calculations, are -- are the appropriate?

After all of what has been said and asked and answered, can you give me a simplified: Is it appropriate? Because you've suggested that the -- they can be min -- lower, so in general, what -- what is your take on are they appropriate or not?

DR. DON HART: Don Hart, EcoMetrix. I just want to be clear. What -- are you talking about the EQC calculations or the proposed guidelines? I didn't actually show any slides on -- about EQC calculations.

MS. YVONNE DOOLITTLE: Yes, the water quality objectives. Sorry, wrong acronym. I'm still learning all of them; pages and pages of them I received last night.

DR. DON HART: Okay. Don Hart, EcoMetrix. Now that we've sorted that out, could you repeat the question?

MS. YVONNE DOOLITTLE: Well, one (1) of the -- when you started off your presentation you were -- you were hoping to determine and respond to us if your assessment of the water quality objectives were appropriate. So, based on the fact that throughout the presentations you recommended that they could be lower, are they appropriate -- what -- in your opinion?

DR. DON HART: Okay. Don Hart, EcoMetrix.

I guess my overall assessment is that they are reasonably protective. That in the cases I pointed out, where the proposed objective is considerably higher than -- than the predicted maximum, there -- there is certainly room to set a lower target in the lake and -- and use that to drive EQCs, the effluent criteria.

THE CHAIRPERSON: Questions from Board members?

What we'd like to do right now then is move down to Environment Canada. And they have a presentation. If they could do that now, please.

(BRIEF PAUSE)

PRESENTATION BY ENVIRONMENT CANADA:

MR. CAREY OGLIVIE: Thank you, Madam Chair. It's Carey Oglivie. I'm head of Environmental Assessment and Marine Programs for Northwest Territories and Nunavut, on behalf of Environment Canada. With me is Sarah-Lacey McMillan, our -- one (1) of our senior EA coordinators and is the lead on coordinating our expert review team.

And I don't know if Anita is still on -- she is still, okay. Anita Li, she's part of our expert support group calling in from our Downsview office. So I'll turn it over to Sarah-Lacey.

(BRIEF PAUSE)

MS. SARAH-LACEY MCMILLAN: Sarah-Lacey

McMillan, with Environment Canada.

So to set out the context of our presentation, in general, Environment Canada agrees with the conclusions presented and the materials submitted to support the water licence amendment request. EC is of the opinion that the conclusions drawn by De Beers are supported by the analysis.

However, there are uncertainties in the impacts to the receiving environment that should be addressed. The specifics of Environment Canada's issues are outlined in this presentation. They relate to the proposed site-specific water quality objectives and effluent quality criteria for total dissolved solids, the outcomes of the TDS treatment system pilot testing programs, seepages from the north pile and water management pond, as well as the potential for stratification of Snap Lake.

Sorry. De Beers has proposed to change the site-specific water quality objectives and effluent quality criteria for total dissolved solids at the Snap Lake Mine. EC is concerned with some of the effluent parameters that are already above the Canadian environmental quality guidelines recommended by the Canadian Council of Ministers of the Environment, and that the long-term effects of increasing TDS concentrations and the concentrations of other parameters in Snap Lake is not clearly understood at this time.

As a result, Environment Canada made the following recommendation. If there is the potential for a deleterious substance to be deposited, best available technology that is economically achievable be applied to achieve the end-of-pipe concentrations that will not result in harm to the aquatic life in the receiving environment. De Beers, in their response to interventions and presented today, has agreed with this recommendation.

De Beers is currently undergoing a pilot testing program to confirm the best option for TDS treatment. Environment Canada remains concerned that the long-term effects of increasing TDS concentrations and the other parameters in Snap Lake is not clearly understood. Sharing the knowledge of the capability of the pilot testing treatment processes to reduce the concentrations of TDS and other parameters of concern is important for the continuing protection of the health of the lake.

Environment Canada made the recommendation that De Beers provide regular updates to the Boards on their pilot testing programs in order that the Board can understand what end-of-pipe limits could be achieved by treating a given volume of effluent.

As you heard earlier, De Beers has agreed with Environment Canada's recommendation, and will provide regular updates regarding progress on source control and treatment to the Land and Water Boards. Environment Canada would like to see this commitment reflected in the final commitments table.

Environment Canada acknowledges that the main contri -- contribution to the high TDS appears to be from the development of the footwall underground, and that targeted treatment is not practical under the current mine operating conditions.

In addition to water from the underground, both the north pile and the water management pond has seepages going to Snap Lake. Environment is concerned that these seepages are adding to the increased TDS in the lake.

Environment Canada made the recommendation that De Beers assess the seepage from the north pile and the water management ponds and quantify the amount of TDS and chloride that are entering the Snap Lake from these seepages. De Beers has responded to this recommendation and provided further detail as to the volumes of seepage from the north pile and water management ponds. EC is satisfied with the response from De Beers.

According to the Canadian Council of Ministers of the Environments chloride fact sheet, increased chloride in surface water has been linked to reducing the vertical mixing of surface waters by way of changing the density gradients of the lake. This is where the layers of water within the lake form, and do not experience vertical mixing, and the phenomenon is referred to as meromixis.

One (1) of the outcomes of stratification of the water layer is that the deeper layer can become quite depleted in oxygen and can limit the survival of aquatic life in this area.

Since TDS, including chloride, in Snap Lake is increasing at a faster rate than what was predicted in the environmental assessment report, EC is concerned that these potential -- there is a potential for stratification in Snap Lake as a result of the increased TDS.

As such, EC made the recommendation that De Beers monitor the water quality parameters such as temperature, pH, specific conductants, dissolved oxygen, and other parameters that would help the iden -

- would help identify the water quality conditions related to the potential for stratification of Snap Lake, and that De Beers develop contingency mitigation measures which can implement in the event this is observed.

So this includes EC's recommendations. Environment Canada would like to thank the Review Board for the opportunity to comment on De Beers-Snap Lake's mine water licence application, and hopes that these technical comments and recommendations will assist the Review Board in making their environmental assessment decision in the proposed project.

QUESTION PERIOD:

THE CHAIRPERSON: Thank you. The Board will now take questions from the GNWT.

MR. ROBERT JENKINS: Thank you, Madam Chair. It's Robert Jenkins with the GNWT. We have no questions for Environment Canada.

THE CHAIRPERSON: Questions from the Yellowknives Dene First Nations?

MR. TODD SLACK: Todd Slack with the Yellowknives. We don't have any questions.

THE CHAIRPERSON: Questions from Lutsel K'e Dene First Nations?

MR. MIKE TOLLIS: Mike Tollis from Lutsel K'e Dene First Nation. I just have one (1) question for Environment Canada. You mentioned that the best available technology that is economically achievable.

Can you elaborate on what you mean by economically achievable?

MS. SARAH-LACEY MCMILLAN: It's Sarah-Lacey with Environment Canada. I'm going to defer to Anita with that one, please.

MS. ANITA LI (BY PHONE): It's required for that to treat that effluent, so that we can get a sense of what it's -- I guess there's a balance whether, you know, the mine closes or it stays open. So that balance has to be looked at, and in most jurisdictions we ask for best available technology economically achievable.

And in the case of -- in this case our headquarter people are looking at this BATEA report. Unfortunately I have no access to that report. It's being reviewed by headquarters. So right now I do not know what is coming out of that report.

MR. MIKE TOLLIS: Thank you. Mike Tollis from the Lutsel K'e Dene First Nation. That helps a little bit. And I don't have any more questions. Thanks.

THE CHAIRPERSON: Questions from North Slave Metis Alliance?

MR. MATT HOOVER: Thank you, Madam Chair. Matt Hoover, North Slave Metis Alliance. We have no questions.

THE CHAIRPERSON: Questions from Deninu K'ue First Nations?

MR. MARC D'ENTREMONT: Thank you, Madam Chair. Marc d'Entremont for the DKFN. We have no questions for Environment Canada. Thanks.

THE CHAIRPERSON: Questions from De Beers?

MS. ERICA BONHOMME: Erica Bonhomme, De Beers. No questions.

THE CHAIRPERSON: Questions from Board staff? Questions from counsel?

MR. JOHN DONIHEE: Yes, thank you, Madam Chair. It's John Donihee, Board counsel. I wonder if you'd just confirm for me my understanding that Environment Canada is not a regulator in -- in this instance and that you're here as a -- an advisor providing scientific advice to the Review Board?

MS. SARAH-LACEY MCMILLAN: Sarah-Lacey McMillan with Environment Canada. That is correct.

MR. JOHN DONIHEE: Thank you, Madam Chair. It's John Donihee. Then I wonder if you would advise the Board whether in the opinion of Environment Canada the proposal advanced by De Beers will cause a significant impact on the environment, or whether, in Environment Canada's view, it might generate significant public concern?

MR. CAREY OGILVIE: Madam Chair, it's Carey Ogilvie with Environment Canada. I think that's a decision for the Board, not necessarily for Environment Canada to make. Thank you.

MR. JOHN DONIHEE: Thank you, Madam Chair. I asked whether in Environment Canada's opinion you could answer those questions. I do understand what the Board's role is. I'm just curious about Environment Canada's role here.

Does Environment Canada have an opinion on those questions?

MR. CAREY OGILVIE: Thank you, Madam Chair. I think with current mitigated mea -- technology it can be managed appropriately.

MR. JOHN DONIHEE: Thank you, Madam Chair. Those are my questions.

THE CHAIRPERSON: Thank you. Questions from Board members? Questions from Board members?

Okay. What we'd like to do now then is take a break for supper, and we'll reconvene here at 6:30. And thank you to the presenters that presented today so far. Thank you.

--- Upon recessing at 5:13 p.m.
--- Upon resuming at 6:41 p.m.

THE CHAIRPERSON: Okay, if we could reconvene the hearing, please. We would like to open the floor now to public comments.

If you could please introduce yourself.

MR. ZHONG LIU: My name is Zhong Liu from Snap Lake Environmental Monitoring Agency. We monitor the mine and also the government agencies related to this mine.

THE CHAIRPERSON: Okay, thank you. And do you have questions?

MR. ZHONG LIU: Yes, Madam Chair -- Chair. So I have a -- I guess I'm -- I'm allowed to ask two (2) questions, or -- or three (3), or...?

THE CHAIRPERSON: Two (2) questions. I think you -- those questions were put forward before. So if you could ask those questions, please. Thank you.

MR. ZHONG LIU: Zhong Liu, SLEMA. So many of you might be aware that current situation at the mine site for TDS issue and chloride issue. Currently total dissolved solid levels and -- the edge of the mixing zone in Snap Lake already above 350 milligram per litres, especially the SNP zero two twenty (020) number is 360 milligram per litre based on the past year -- past few years data. And the whole lake average number will be very close to this one. It should be lower, but be close to the mixing zone level, because it's a well mixed lake.

So here is the -- is the -- the question, because the whole lake average -- this water license limit is for whole lake average is three hundred and fifty (350) so right now it's in -- in -- I'm not sure whether is -- is already above that lem -- limit.

So I -- my first question is: Because De Beers just finished their AEMP monitoring for the winter season, for the past winter season, so I'm wondering whether this -- they are AEMP data, pre -- preliminary data available to calculate whole lake average?

THE CHAIRPERSON: And --

MS. ERICA BONHOMME: Erica Bonhomme.

No, we don't have that data yet.

MR. ZHONG LIU: Zhong Liu, SLEMA. So many of you might also be aware that in -- in April and May, in there was another exceedance for chloride at -- in their mine-treated effluent. So that's -- that's not the first one. And last year there -- was another one. September/October 2013 there's a -- there was another exceedance of chloride, about the loading average of water license limit for chloride. So that's the -- no, that's a -- a concern. Right now, I guess, the land department has been taking legal samples to make sure compliance and not -- it will not happen or -- again.

But the issue is -- so this is my comment here -- so the issue is there's no effective mitigation measures in place to prevent that exceedance from recurring. So this is my -- my -- because for the past years, the level of chloride has been up and very close to the loading average number for -- for water license limit, so three hundred and ten (310). So that's very, very, kind of, risky institution (sic) for De Beers.

So here -- so I -- I think -- right now, their approach to mana -- to pur -- to managing chloride at the mine site is kind of walk in the -- in the tightrope. So that's kind of always will be kind of maybe -- maybe above that water license limit.

That's my follow-up comments for -- for the chloride level discharge from Snap Lake mine.

THE CHAIRPERSON: Can I just ask if your comments are leading towards a question?

MR. ZHONG LIU: Yes. So now I'll ask my second question. De Beer (sic) proposed a -- a site-specific water quality objective of 684 milligram per litre for TDS, and also they are doing some other study for -- for some treatment technology. They ba -- I guess they assumed they will -- the -- the discharge level will be lower than six hundred and eighty-four (684) as they are -- because that -- they're -- they also propose a EQC that's also the same number, 684 milligram per litre of TDS.

The issue is right now you don't have the Yellowknives -- you don't have the Denes -- Lutsel K'e Denes -- the -- and also GNWT also proposed another set of specific water quality object -- objective. They propose a 500 milligram per litre.

My question is: What is the bottom line for De Beers to consider how much water will be treated if De Beers -- you -- De Beers proposed a -- a set -- set EQC or a site-specific water quality objective was not approved by the Board but instead the Board approved 500 milligram per litre of TDS as their -- as the site-specific water quality objective?

(BRIEF PAUSE)

MS. ERICA BONHOMME: Yeah. Erica Bonhomme, De Beers. I think your -- your question, Mr. Lui is a -- a bit hypothetical. We've -- we've indicated that we will meet an appropriate and achievable site specific water quality objective. What we have proposed is six hundred (600) and -- six (6) -- 684, thank you, milligrams per litre TDS. And we have also indicated that we will meet an appropriate site specific water quality objective.

So I think that to ask us how we will meet a site specific water quality objective of five hundred (500) is not something we have contemplated.

THE CHAIRPERSON: Do you have a final comment?

MR. ZHONG LUI: Thank you, Madam Chair. So my final comment will be here.

So De Beer has been claiming they are pro-actively manage the water at the mine site, but based on my observation for the past few years, they met -- they did have lots of improvements in managing water at the mine site but their approach for -- me -- for -- for long-term -- for long time they -- they kind of not proactive; is reactive.

In 2009, SLEMA already show letter of potential exceedance of water licence limit. And the next year 2010 SLEMA in -- issue another letter and the ve -- and to confirm just kind of potential exceedance via modelling work. And then the following year for the water lic -- during water licen -- water licence renewal process and De Beer present some modelling result.

In their -- De Beers has -- has TDS, calcium and chloride sampling plan. In that plan they should have been -- provide modelling update every year, but I didn't see any result before 2010. So they are not pro -- proactively manage water via modelling work.

So -- and also because of this situation -- because right now we only one (1) reading -- in one (1) year we have to finish two (2) public hearing for environmental assessment and water licence amendment. This situation De Beer (sic) could -- could have done better to schedule this -- this issue -- to man -- to manage this -- this issue.

And also -- I also encourage De Beers to really take proactive approach to manage the environmental and water at the mine site. And also I encourage Review Board and the Water Board also proactively manage the file. That's my final comment. Thank you, Ms. -- Madam Chair.

THE CHAIRPERSON: Thank you. We have come to the end of the day for our hearing and we would like to adjourn our hearing until tomorrow morning at nine o'clock. Thank you.

--- Upon adjourning at 6:52 p.m.

Certified Correct,

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Bob Keelaghan, Mr.

H