



MACKENZIE VALLEY ENVIRONMENTAL  
IMPACT REVIEW BOARD  
and  
MACKENZIE VALLEY LAND AND WATER BOARD

JOINT TECHNICAL SESSION

De Beers Canada Inc. - Snap Lake Mine, NT

Type A Water License Amendment

Application MV2011L2-0004

ENVIRONMENTAL ASSESSMENT

EA1314-02

HELD AT:

Yellowknife Inn

Yellowknife, NT

April 15, 2014

Day 1 of 2

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1 --- Upon Commencing

2

3 MR. SIMON TOOGOOD: ...a process for  
4 both the Land and Water Board and the Review Board.  
5 And it's where we have an opportunity to have face-to-  
6 face discussions and hopefully come to a resolution on  
7 any issues.

8 There's going to be opportunity during  
9 our breaks to have off-line dialogue and that's  
10 encouraged. But if there's any resolutions to any  
11 issues, please, let's get that on the record after the  
12 breaks. There's going to be transcription, so we have  
13 someone on line who's going to be recording everything  
14 that's said. And as I already made the first mistake,  
15 please state your name and who you're with at the  
16 beginning of -- of -- whenever you speak.

17 There's going to be breaks throughout  
18 the day and there's going to be lunch, not provided.  
19 And hopefully this gets wrapped up at five o'clock.  
20 It's two (2) days. The agenda -- we have an agenda  
21 that's -- we're going to try and stick to the -- at  
22 least the order of what's there. But hopefully the  
23 timing may be quicker, might be longer. We have two  
24 (2) days. We'll see how it goes.

25 Now, we're not the Board. The staff

1 here, we're not the decision makers. We work for the  
2 Review Board and the Land and Water Board. They're the  
3 ones who are going to be making the decisions. We're  
4 here to get evidence and information so that we can  
5 present that to the Board. So there may be Information  
6 Requests coming out of this process. Hopefully we'll  
7 have those ready and posted for tomorrow for the  
8 Developer to start working, I hope.

9                   So without further ado we're going to  
10 have a bit of an introduction by the Executive Director  
11 of the Mackenzie Valley Land and Water Board, and the  
12 Mackenzie Valley Environmental Impact Re -- Impact  
13 Review Board and that's going to be Mark Cliffe  
14 Phillips and Zabey Nibitt -- Nevitt, sorry. So, yeah,  
15 you want to pass it along?

16

17                   (BRIEF PAUSE)

18

19                   MR. MARK CLIFFE PHILLIPS: Okay. Well,  
20 as Simon goes through his -- his computer here and try  
21 and -- and try and find the -- the work plan. I -- I'm  
22 Mark Cliffe Phillips, as -- as Simon said, the  
23 Executive Director with the Mackenzie Valley  
24 Environmental Impact Review Board. What Zabey and I  
25 are intending to do is just talk a little bit about our

1 process. This is a little bit unique. This is the  
2 first time that the Land and Water Board and the Review  
3 Board have held a joint technical session and a -- and  
4 a joint process in any manner.

5                   So it is a -- a learning curve for --  
6 for both our organizations, but we wanted to talk a  
7 little bit about where we're at in our process and  
8 where the next steps are. Just so people understand  
9 the context of -- of where this particular technical  
10 session fits.

11                   So as -- as Simon's still getting this  
12 up.

13

14                   (BRIEF PAUSE)

15

16                   MR. MARK CLIFFE PHILLIPS: Okay. Well,  
17 maybe I'll just speak to the process and as -- as  
18 things come up I -- I think we have copies of the work  
19 plan over at the desk where -- where Stacey Menzies,  
20 our logistical person from the Review Board is -- is  
21 sitting.

22                   So in -- in terms of where we're at  
23 there was an application, a water licence application,  
24 as you all know for certain amendments to the De Beers  
25 Snap Lake water licence which was sent to the Mackenzie

1 Valley Land and Water Board.

2 Subsequently that -- that application  
3 was referred to the Mackenzie Valley Environmental  
4 Impact Review Board. The -- it's a unique referral in  
5 -- in the sense that there was an environmental  
6 assessment already conducted for the Snap Lake Mine  
7 previously. And -- and with that there were specific  
8 measures that came out of that, recommendations that  
9 were accepted by the -- the Federal Minister of -- of  
10 Indian Norther Affairs at the time.

11 With that the -- there was a specific  
12 measure or -- or measures that referred to a limit on  
13 the -- the amount of total dissolved solids that was  
14 then turned into conditions in the licence. The  
15 amendment -- one (1) of the amendments that was within  
16 the water licence application was looking to change  
17 that -- that number within the water licence to a  
18 number that was above what was considered in the  
19 measure of the envir -- the original environmental  
20 assessment. And with that, that was the -- the trigger  
21 for the referral to the Mackenzie Valley Environmental  
22 Impact Review Board.

23 So with the -- the unique nature that  
24 this wasn't a -- a referral of an entire mining  
25 project, it was for a specific component of that

1 project, it's a -- it was a little bit different for us  
2 to come up with the process that we would normally do  
3 for a normally for an environmental assessment. So we  
4 had to set out scoping the development to limit what  
5 we're discussing, taking into consideration what has  
6 already been assessed previously under the last  
7 environmental assessment.

8                   As of the coming into force of the  
9 Mackenzie Valley La -- or Resource Management Act  
10 amendments, there's actually a section within there now  
11 that says that we must consider the outcomes of the  
12 previous environmental assessments. So that's just  
13 formalizing the approach that we were already taking in  
14 -- in our scoping reasons.

15                   So with that we did produce a -- a -- or  
16 we ended up doing a joint review process for the Land  
17 and Water Board and for the Impact Review Board leading  
18 up to this technical session. But prior to that we, at  
19 the Review Board, our Board made a decision on the  
20 scope of this particular environmental assessment and  
21 limited the scope to looking at the -- the changes  
22 associated with TDS and its constituent parameters. We  
23 also have copies of the reasons for decision available  
24 for -- for people at the back, and it's available on  
25 our registry.

1                   So right now we've been running a joint  
2 review process because the information that is being  
3 garnered out of the review of the water licence  
4 application and the -- the review that the -- the  
5 Environmental Impact Review Board is doing is going to  
6 benefit both the Land and Water Board and the Review  
7 Board.

8                   But there -- after the technical  
9 sessions, there is a point where our processes need to  
10 diverge. From the end of this -- this session here the  
11 Review Board will then undertake its public hearing  
12 process, which ultimately leads to a -- a report of  
13 environmental assessment with recommendations which  
14 ultimately become measures. And then the process would  
15 then return back to the Mackenzie Valley Land and Water  
16 Board. And I'll let Zabey speak to their process now.

17                   MR. ZABEY NEVITT: Thank you very much.  
18 Zabey Nevitt with the Mackenzie Valley Land and Water  
19 Board. Before I do that I just want to talk to some  
20 very important administrative items that we might have  
21 forgotten about. The washrooms are out the back here.  
22 That's the way out. And the coffee might be at the  
23 back at some point. So you can walk around with a cup  
24 at the moment, but we'll get you some refreshments  
25 along the way.

1                   Yeah, as Mark said this is the first  
2 time we've done this. This is a new process. It is  
3 allowed for in the Mackenzie Valley Resource Management  
4 Act. It's a -- it was part of the envisionment of an  
5 integrated resource management regime, and so we're --  
6 we're doing what we can to -- to make this process as  
7 smooth and as effective as possible.

8                   So Mark sort of explained where we got  
9 to in the EA decision phase. Following that we -- we  
10 essentially pick up again where we left off from at the  
11 end of this process, which is the -- is the -- will be  
12 the technical session Information Requests. Those get  
13 finalized from the Land Water Board's sort of side  
14 around April 30th. And then there's the pause on from  
15 our side as the -- the Review Board does their process.

16                  And then we move back to the Land and  
17 Water Board after that with the -- the call for  
18 interventions and the -- the issuance of a draft water  
19 licence. And -- and then into the standard process  
20 that happens for every water licence proceeding we  
21 hold, coming towards a final hearing. And the -- the  
22 comments on the licence, closing arguments, and  
23 eventually the Board will make their decision for  
24 issuance to the Minister. That's just the brief  
25 summary of it.

1 I think all these work plans are  
2 available. There -- I think there are some paper  
3 copies at the front of the room. They're available on  
4 websites. All of the materials in terms of the record  
5 is being put to both the Land and Water Board and the  
6 Mackenzie Valley Environmental Impact Review Board  
7 websites. So you can find it -- the -- the record will  
8 be available so the Boards themselves will have all of  
9 the information available to them as we move forward.

10 Encourage any questions on the -- on  
11 this. There are some questions that we may ask for to  
12 be put in writing if they are substantial process  
13 questions. Other than that, I encourage everybody to  
14 have as much discussion and dialogue as they can.  
15 We're -- we're aiming here to make as much concordance,  
16 as much agreement, as we possibly can. What we can't  
17 resolve though, of course, we'll carry on into the  
18 process. And there's lots of process left to give  
19 people lots of time to provide input. So with that,  
20 thank you. I'll hand it back to Simon.

21 MR. SIMON TOOGOOD: Thank you very  
22 much. Before we get into the presentation by De Beers  
23 I thought it would be helpful to have a roundtable. I  
24 guess we could start off at -- we'll start off with me,  
25 Simon Toogood. And we'll go over to Kathy Racher and



1 work our way around the room.

2 DR. KATHY RACHER: Okay. Kathy Racher  
3 on behalf of the Mackenzie Valley Land and Water Board.

4 MS. LINDSEY CYMBALISTY: Lindsey  
5 Cymbalisty for the Mackenzie Valley Land and Water  
6 Board.

7 MR. MARC CASAS: Marc Casas, also from  
8 the Mackenzie Valley Land and Water Board.

9 MS. ROSANNA NICOL: Rosanna Nicol with  
10 the Mackenzie Valley Land and Water Board.

11 MS. SARAH-LACEY MCMILLAN: Sarah-Lacey  
12 McMillan with Environment Canada. Anita Li is also  
13 dialling in. We're just having a little bit of  
14 technical difficulties. Is there any chance that the  
15 volume could go up? Okay. Great. Thanks.

16 MR. ALAN EHRLICH: Alan Ehrlich with  
17 the Review Board.

18 MS. SACHI DESOUZA: Sachi DeSouza with  
19 the Review Board.

20 MR. CHUCK HUBERT: Chuck Hubert with  
21 the Review Board.

22 MR. RICK WALBOURNE: Rick Walbourne,  
23 GNWT-ENR.

24 MR. PAUL GREEN: Paul Green with GNWT-  
25 ENR.

1 MR. SEAN WHITAKER: Sean Whitaker,  
2 GNWT-ENR.

3 MR. ZHONG LIU: Zhong Liu with SLEMA.

4 MR. MATT HOOVER: Matt Hoover, North  
5 Slave Metis Alliance.

6

7 (BRIEF PAUSE)

8

9 DR. KATHY RACHER: Did you want to get  
10 those guys again? Yeah. Kathy Racher for the Board.  
11 There seems to be a problem with the -- the mic for the  
12 North Slave. Could you -- Simon, could you just move  
13 the mic in the middle over to -- to them?

14

15 (BRIEF PAUSE)

16

17 MR. ED JONES: Ed Jones, North Slave  
18 Metis Alliance.

19 MS. ERICA BONHOMME: My name's Erica  
20 Bonhomme. I'm with De Beers Canada. I'd just like to  
21 introduce our whole team. My colleagues from De Beers  
22 here are Julie L'Heureux, David Putnam, Alexander Hood,  
23 Michelle Peters are in the back. And from Itasca,  
24 Houmao Liu. Peter Chapman, Alison Snow, Tasha Hall,  
25 and Hilary Machtans, and they're all from Golder

1 Associates.

2

3 (BRIEF PAUSE)

4

5 MR. LIONEL MARCINKOSKY: Lionel

6 Marcinkosky with GNWT-ENR.

7 MR. PAUL MERCREDI: Paul Mercredi,

8 GNWT-Lands.

9 MS. LINDSAY LUKE: Lindsay Luke, GNWT-

10 ENR.

11 MS. STACEY MENZIES: And Stacey Menzies

12 from the Mackenzie Valley Review Board.

13 MR. SIMON TOOGOOD: Okay. Is there

14 anyone else on the phone? If you could please

15 introduce yourself.

16

17 (BRIEF PAUSE)

18

19 MR. SIMON TOOGOOD: We'll -- if there's

20 anyone on the phone will you please introduce yourself?

21

22 (BRIEF PAUSE)

23

24 MR. SIMON TOOGOOD: Okay. There's at

25 least two (2) people on the phone. There's one (1)

1 person from Environment Canada. I -- yeah, but they  
2 can't hear us at the moment, so we'll just give this  
3 about four (4) minutes, hopefully we can sort this out.

4

5 (BRIEF PAUSE)

6

7 MR. SIMON TOOGOOD: Hello, everyone.  
8 We have people back on the phone. It's Simon Toogood  
9 with the Review Board. If you could please take your  
10 seats and we'll get started.

11

12 (BRIEF PAUSE)

13

14 MR. SIMON TOOGOOD: Okay. Hi, it's  
15 Simon Toogood with the Review Board. So as everyone  
16 has taken their seat if the people on line, we're about  
17 to have a presentation by the -- by the Developer. And  
18 if you could -- I believe you should have an electronic  
19 version, and it's the first presentation. It's the  
20 Snap Lake water licence amendment application overview.  
21 If you could open that up and then I'll hand it over to  
22 De Beers.

23 And please, De Beers, when you're giving  
24 your presentation could you just indicate what slide  
25 you're on so people can follow along? Thanks. I'll

1 hand it over to Erica.

2

3 PRESENTATION BY DE BEERS - OVERVIEW:

4 MS. ERICA BONHOMME: Good morning. My  
5 name's Erica Bonhomme. I'm with De Beers Canada, Snap  
6 Lake Mine. I'm the Manager of Environment. I'm going  
7 to begin with an app -- overview of the application as  
8 we've submitted it, as well as some supplemental  
9 information that was more recently filed. And that'll  
10 follow immediately by a presentation by Houmao Liu on  
11 the groundwater models. It's -- I don't think this  
12 thing's working.

13

14 (BRIEF PAUSE)

15

16 MS. ERICA BONHOMME: Slide 2 is an  
17 overview of the -- of our -- our -- some key  
18 infrastructure we're going to speak to in the  
19 presentations today. We'll refer to the Water  
20 Management Pond; freshwater intake; the place where all  
21 the pipes come out of the ground, we'll call that  
22 underground mine dewatering portal; the diffusers which  
23 is where mine effluent enters Snap Lake; and the water  
24 treatment plant.

25 We also in -- for those of you in the

1 building here we have a -- a map of the mine site. And  
2 should we re -- need to refer to it today I have a map  
3 showing all the SNP surveillance network program  
4 stations, as well as stations we use for monitoring  
5 under the Aquatic Effects Monitoring Program. So we  
6 can refer to that if we need to throughout the day.

7 Slide 3. The water licence amendment  
8 app -- application was submitted in December of last  
9 year. Generally, De Beers is applying to change the  
10 quality of water allowed to be discharged to Snap Lake.  
11 The application to amend the licence was initiated  
12 after a review of the recommendations that show that  
13 the current water licence water quality requirements  
14 may be overly protective.

15 The water licence also -- the -- the  
16 water licence amendment application also proposes a  
17 number of minor regulatory and administrative changes  
18 that are intended to provide more clarity to terms.  
19 Overall, the proposed amendments are intended to  
20 improve efficiency of mine operations and reduce costs  
21 in the long term, all -- all while ensuring that the  
22 water remains safe to drink and the aquatic life in  
23 Snap Lake remains healthy.

24 Slide 4. There have been a number of  
25 opportunities to learn about and discuss water quality

1 at Snap Lake, including the proposed changes. Prior to  
2 the application being filed De Beers hosted site visits  
3 during May and June and, again, in July to review water  
4 management systems in place.

5 In September community members attended  
6 the annual fish tasting event conducted under the  
7 Aquatic Effects Monitoring Program. Since the  
8 application was filed De Beers hosted an information  
9 session on January 6th. De Beers also hosted  
10 government agencies, as well as the Sla -- Snap Lake  
11 Environmental Monitoring Agency technical staff for a  
12 site tour on March 11th. And, finally, the water  
13 licence was discussed as part of a meeting on project  
14 updates held in Mar -- on March 20th. De Beers again  
15 plans to host community site visits and fish tasting in  
16 2014.

17 Slide 5. The application is supported  
18 by a number of studies and reports which will be  
19 summarized during the various presentations over the  
20 next two (2) days. These include a groundwater model;  
21 a site water model; and a Snap Lake mo -- water model;  
22 reports of toxicity studies; and the development of  
23 site-specific water quality objectives for TDS,  
24 fluoride, nitrate, and strontium; and a description of  
25 the methodology for developing associated effluent

1 quality criteria.

2 Slide 6. There were three (3) specific  
3 plans required to be filed as part of the current  
4 licence. The TDS Response Plan, the Nitrogen Response  
5 Plan, and the Strontium Response Plan. Those are all  
6 included as part of the application.

7 There's also information that was filed  
8 on April 11th, including a memo regarding the site-  
9 specific water quality objectives for strontium, and a  
10 memo regarding a second toxicity test for daphnia  
11 magna, the re -- results of which is important and Dr.  
12 Peter Chapman will speak to that later today.

13 Finally, as also filed on April 11th,  
14 was additional information intended to specifically  
15 address the requirements of Section 117 of the MVRMA as  
16 they pertain to the aspects of the application within  
17 the scope of the environmental assessment.

18 Slide 7. I'm going to overview a -- a  
19 few of the key terms used in the application. There's  
20 also a glossary that we've dropped off at the back and  
21 -- and distributed around the table. Site-specific  
22 water quality objectives is a term we'll use. You'll  
23 see the -- the acronym SSWQO used. They -- they refer  
24 to -- they -- they refer to water quality appl --  
25 levels that apply in the lake and that are protective



1 of the aquatic life. It's a specific concentration of  
2 a substance beyond which detrimental effects to aquatic  
3 health may occur.

4                   Water quality objectives can also be  
5 defined by EQCs, which are protective of aquatic life.  
6 What they mean is that there are concentrations below  
7 which there are no effects to aquatic life and they're  
8 measured in the whole lake. EQCs are concentrations  
9 that can be discharged to the lake without exceeding  
10 site-specific water quality objectives. They're  
11 measured end-of-pipe.

12                   Effluent refers to the water discharged  
13 from the water treatment plant to Snap Lake through the  
14 diffuser. And the schematic here shows where we  
15 measure water quality objectives and where we measure  
16 against water quality objectives in the lake, and where  
17 we measure effluent quality -- against effluent quality  
18 criteria at the end-of-pipe.

19                   There are two (2) SNP stations that are  
20 important: SNP 02-17B, which is the end-of-pipe  
21 measurement, and SNP 02-20 which refers to the mixing  
22 zone around the diffuser. You'll see Alison Snow speak  
23 to that in a little bit. And AEMP SNP station 02-18,  
24 which describes conditions in the Snap Lake receiving  
25 environment.

1 Slide 8. This is an overview of the  
2 proposed changes to the water licence EQCs. I wonder  
3 if someone can just focus that projector a little bit.  
4 Thank you.

5 Just some highlights here. A note that  
6 ammonia and nitrate limits are not proposed to be  
7 increased, but they're included here because the water  
8 licence required De Beers to recommend EQCs based on  
9 site-specific studies.

10 Slide 9. Before we go into Houmao's  
11 presentation I'm going to just give a brief overview of  
12 and an introduction to the groundwater and site models.  
13 I think everyone's aware that Snap Lake Mine is an  
14 underground mine. Very generally, the modelling  
15 predicts that loadings to Snap Lake of total dissolved  
16 solids, TDS, nitrate, and its constituents will  
17 increase over mine life; that is, to 2028.

18 Mining requires development of lower  
19 underground pro -- passageways for infrastructure and  
20 hauling of ore to support mining. We call this  
21 footwall development. The extraction of kimberlite ore  
22 occurs in the hanging wall, and that's the -- in the  
23 green zone above.

24 Footwall development encounters higher  
25 TDS concentrations in the groundwater, called connate

1 groundwater; whereas hanging wall, and in some cases as  
2 well as the footwall, receive large volumes of water  
3 that make its way through geological structures  
4 directly from Snap Lake above.

5 Finally, during mining, nitrates enter  
6 water through the use of explosives. And we're going  
7 to get a -- into all of this in a lot more detail.

8 Slide 10. Snap Lake's water treatment  
9 plant currently treats for sediment, total suspended  
10 solids, and adjusts the pH of water. It does not treat  
11 for TDS, ammonia, or nitrates.

12 When we use the term 'clear water', it  
13 refers to water pumped from underground that has lower  
14 amounts of TSS. 'Dirty water', on the other hand,  
15 refers to water pumped from the underground that is  
16 high in TSS. It also includes high TDS connate water.

17 Currently, Snap Lake Mine treats and  
18 discharges up to 43,000 cubic metres of water per day.  
19 Mine effluent quality and quantity are monitored --  
20 monitored at SNP Station 02-17b, which I showed you on  
21 the earlier figure, which is an inline meter.

22 And finally, just a very generalized  
23 water balance model for Snap Lake Mine. It shows you  
24 that 9 -- 99 percent or more of the water that ends up  
25 in Snap Lake is generated in the underground. It

1 includes clear water and dirty water that I mentioned.  
2 Less than 1 percent, respectively, come from freshwater  
3 withdrawn from Snap Lake for domestic use and for fire  
4 suppression. And less than 1 percent is derived from  
5 surface water, including seepage from the North Pile  
6 and runoff. All of that water reports to the water  
7 management pond and water treatment plant before it's  
8 discharged to Snap Lake.

9 And with that, I'll turn that -- I'll  
10 turn it over to Dr. Houmao Liu, who will speak to the  
11 under -- underground model.

12

13 (BRIEF PAUSE)

14

15 PRESENTATION - UNDERGROUND MODEL

16 DR. HOUMAO LIU: Houmao Liu. Thank  
17 you, Erica, for the introduction, and that's a very  
18 good introduction. Good morning. My name's Houmao  
19 Liu. I'm with Itasca Denver. I'm principal  
20 hydrogeologist. I have over twenty (20) year of  
21 experience in mining hydrogeology and groundwater flow  
22 model.

23 And this -- my topic here is the Snap  
24 Lake groundwater flow model update. And I'm doing the  
25 presentation, but that's team effort between Itasca and

1 Snap Lake hydrogeologist.

2 Now, slide 2, basis of model. Now, what  
3 the difference of this model over the previous model, I  
4 think I want to emphasize two (2) big bullet item here.  
5 One (1) is nine (9) years of operation data. And in  
6 that, we continuous understanding and mapping  
7 geological structure.

8 As Erica just mentioned, geological  
9 structure is a key feature that introduce the water  
10 into the mine working. And then continuous measurement  
11 of underground mine discharge rate over nine (9) years  
12 and the continuous measurement of total dissolved  
13 solids, or TDS, in the underground mine discharge.

14 The second bullet item I want to say  
15 here is Itas -- Itasca's accumulated knowledge since  
16 2001. We start working on these projects since 2001.

17 Slide 3. I want to give a basic idea of  
18 groundwater flow. I know lots of here, you are, you  
19 know, technical sound words to them, (sic) but just  
20 give a basic concept of groundwater flows as -- as  
21 introduction.

22 Groundwater flow essentially flow by  
23 energy. So con -- it's follow the law called Darcy's  
24 Law. It's from flow -- flow from high energy to low  
25 energy. So the key item here, it's -- we have a flow

1 rate. It's linear proportional to hydraulic  
2 conductivity -- that means how permeable rock is -- and  
3 then the area that groundwater flow will pass through.

4 And then delta 'H' over delta 'L' is  
5 hydraulic gradient. The gradient means how much energy  
6 drop over even distance. So this key item that control  
7 the flow rate. And the groundwater model is a three  
8 (3) dimensional realization of these basic concept.

9 Slide 3 (sic). As Erica just mentioned  
10 that Snap Lake has hanging wall that's above the dike,  
11 above the mining zone, and then the footwall that below  
12 the mining zone. And now the -- the upper one above  
13 the mining zone in the footwall, the water is quite  
14 clean. And below the mining zone in the footwall, the  
15 water could be connate water with high TDS.

16 As mining proceed, as you can see here,  
17 mining is down deep from the southwest to northeast  
18 corner. As mining proceed, the water from both hanging  
19 wall and the footwall will migrate or seep into the  
20 mine working. And those water is defined as  
21 underground mine discharge.

22 Slide 5. This is just a quick summary  
23 of what our current status of knowledge of underground  
24 mine discharge. And I want to summarize in three (3)  
25 key bullet.

1                   The first key bullet is a -- it's about  
2 the mining beneath Snap Lake and the permafrost. As  
3 you know, mostly -- most of mining -- the current  
4 mining is under the Snap Lake. So the water of  
5 underground mine discharge under current condition  
6 originate from Snap Lake. And now we need to think  
7 about the future mining, because future mining -- large  
8 portion of future mining is under permafrost. And so  
9 the permafrost is frozen rock outside of lake. And it  
10 is about 200 metre thick. Permafrost is considered to  
11 be impermeable. So under these conditions, the future  
12 mining, you would expect the inflow to the mine working  
13 would be reduced or stabilized.

14                   Now, second bullet item here, it's our  
15 current understanding of -- of geological structure has  
16 been improved a lot, as I will show in a later slide.  
17 And so extensive geological structure had been  
18 identified.

19                   And the third, most of the groundwater  
20 that seeped to the mine working if -- it's through  
21 geological structure, based on the nine (9) years of  
22 observation.

23                   Slide 6. As I just mentioned before, we  
24 have identified the key -- or the mine has identified  
25 an extensive geological structure in the cur -- under

1 the current mine footprint, as you see this orange  
2 line, and then over the future mine working.

3 And also, you can see here -- now, the  
4 second point I want to show here is current mining. As  
5 you see here, the blue line here, that's a -- that's a  
6 Snap Lake outline. And the most of current mining,  
7 it's under the lake, or beneath the lake.

8 The third one I want to point out here,  
9 it's the future mining. Quite large amount of area  
10 that's outside of lake that's under permafrost.

11 Now, with these extensive structure,  
12 they all interconnected. And the -- the grouting has  
13 been tried at the mine, and the -- it seem like it's --  
14 it's not physical to do the grouting, extensive  
15 grouting, with this extensive geological structure.

16 And the lastly, in our model, we  
17 incorporate nine (9) geological structure zone. As you  
18 can see here, different colour represent different  
19 geological structure zone. And it's also shown in the  
20 legend here, nine (9) geological structure zone,  
21 including the model, to -- to predict -- to calibrate  
22 model and to predict the future mine groundwater --  
23 groundwater discharge.

24 Slide 7. As I just mentioned, the --  
25 mostly the mining is under -- beneath Snap Lake. So



1 you can see quite linear relation of mine ground --  
2 underground mine discharge versus mining area. But  
3 please note, in the future mining, as I mentioned, the  
4 mining would be outside of Snap Lake under the  
5 permafrost. This relation will not hold, because it  
6 will be much less water or source of water that -- that  
7 discharge into the mine working.

8                   So we -- we feel that we have a quite  
9 good understanding of data in the geological structure  
10 for the -- for the underground mine discharge. Now,  
11 what's our status of knowledge of TDS in underground  
12 mine discharge?

13                   Essentially, there are three (3) main  
14 points that we want to make here. The first one is  
15 that two (2) different groundwater sources of TDS, as  
16 Erica mentioned: the hanging wall and the footwall.  
17 And hanging wall, usually it's quite clear water with  
18 low TDS concentration. And the footwall has a higher  
19 TDS concentration, depending -- from very shallow now,  
20 it can go up to 20,000 milligram per litre. It just  
21 based on the measurement.

22                   And the TDS concentration has been  
23 monitored in seeps to both the hanging wall and the  
24 footwall during operation. And this monitoring data in  
25 the seep do not show the trend along the depth.

1                   Third, the TDS concentration in  
2 underground mine discharge depend on the ratio of  
3 seepage rate to the hanging wall and to the footwall  
4 mine working. Certainly with -- with a footwall, has  
5 higher concentration, and the hanging wall has lower  
6 concentration. The volume would play an important role  
7 of how much TDS loading would be.

8                   Slide 9. This just a conceptual model  
9 of TDS calculation. As you can see in this slide, we  
10 have a flow coming from hanging wall and a flow coming  
11 from footwall. Essentially, what we do here, just based  
12 on volumetric mixing of how much water coming from  
13 hanging wall, how much water coming from footwall, and  
14 with -- given the concentration of ambient TDS  
15 concentration, ambient groundwater, and mix them  
16 together, calculate how much -- how much TDS would be  
17 in mine groundwater discharge.

18                   In the meantime, we mix with Snap Lake  
19 water. And then, from there, we calculate how much  
20 concentration -- TDS concentration change in Snap Lake  
21 then as a source again to apply to the hanging wall.  
22 So it's just very simple volumetric mixing calculation.

23                   Slide 10. Using the mine plan and the  
24 geological data, the groundwater flow model has been  
25 updated. And at first it was calibrate to the measure

1 underground mine discharge as -- as showed here, the  
2 blue dots. As you can see, the groundwater flow model  
3 essentially capture the behaviour of mine discharge  
4 rate over last nine (9) year. And based on that  
5 calibrate, groundwater flow model would predict the  
6 future inflow rate or underground mine discharge in the  
7 future mining. And the highest rate we'll get, it's  
8 about 60,000 cubic metre per -- per day.

9                   And as you can see here, when it's mine  
10 under the permafrost, the inflow or the additional  
11 groundwater seepage to the mine working is --  
12 essentially is not significant.

13                   Now, the bottom line here, it's -- the  
14 green line, it shows the inflow to the waste drift or  
15 footwall. As you can see here, the -- the inflow to  
16 the waste drift or footwall, it's only small fraction  
17 of total underground mine discharge. That's what I  
18 said in -- before. That's the mixing. So you actually  
19 control how much -- how much of TDS loading would be.

20                   Now slide 11. Based on the predict  
21 inflow to the -- both to the hanging wall, or seepage  
22 away from hanging wall and the footwall, then we did a  
23 calculation of measured TDS concentration in  
24 underground mine discharge.

25                   As you can see, there are two (2) kind

1 of -- two (2) mode of -- based on this measured TDS  
2 concentration, the brown colour, there's two (2) mode  
3 of TDS concentration you can see here: the initial  
4 surge with high TDS concentration, then it start  
5 dropping down. And that initial surge is due to the  
6 development of footwall. And then as more hanging wall  
7 water coming in, it dilute the water, and the TDS  
8 concentration drop.

9                   And during our calculation for the  
10 future underground mine discharge TDS concentration, we  
11 use two (2) different ambient TDS concentration. One  
12 use geometric mean; the other one use arithmetic mean  
13 as a TDS concentration of ambient hanging wall and the  
14 footwall groundwater. As you can see, those two (2)  
15 approach capture the -- the upper and the lower range  
16 of the major TDS concentration.

17                   Slide 12. So to summarize from slides -  
18 - slide 11, and still three (3) key bullet item. As I  
19 mentioned before, the monitored TDS concentration shows  
20 two (2) modes: high value during the initial stage of  
21 footwall development, and a decreasing trend following  
22 that initial surge.

23                   Now, second one is two (2) TDS  
24 concentration were assume for foot -- hanging wall and  
25 the footwall groundwater to capture such variation. As

1 it show here, the -- the value I use -- we use.

2 Now, the third bullet item, as I just  
3 show in the last slide, it's a -- the predicted TDS  
4 concentration capture the possible range of future TDS  
5 concentration in underground mine discharge.

6 I want to summarize my -- our  
7 presentation with a -- just two (2) key item here, just  
8 about the certainty of the model. I think the model,  
9 it's a -- it's a -- has a quite high certainty. For  
10 first, model is calibrated nine (9) years of monitoring  
11 data related to underground mine discharge rate and  
12 also TDS rate in underground mine discharge. And the  
13 second is model incorporate updated structure data into  
14 the future mining.

15 With that, thank you for your attention.

16

17 (BRIEF PAUSE)

18

19 MR. SIMON TOOGOOD: Thank you very much  
20 for your presentations. It's Simon Toogood, with the  
21 Review Board.

22 So let's go into questions for -- from  
23 the room on these presentations. I see --

24 DR. KATHY RACHER: Just one (1) second.  
25 Kathy Racher, for the Board. So you just -- the

1 presentation on the other models comes -- you wanted to  
2 do questions first. We -- we kind of organized it so  
3 the presentations were on all the models first, and  
4 then questions on all the models. But perhaps it is  
5 better this way.

6 MS. ERICA BONHOMME: Either way. If  
7 you want to do them, we're prepared to continue on with  
8 all the models.

9 DR. KATHY RACHER: Okay. Kathy Racher,  
10 for the Board. Actually, that was a lot of  
11 information. Very well presented, though. Thank you.  
12 So maybe we will do questions first on this. And Rick  
13 looks anxious to ask a question.

14

15 QUESTION PERIOD:

16 MR. RICK WALBOURNE: Rick Walbourne.  
17 I'm going to let Sean go ahead here first, Sean  
18 Whitaker.

19 MR. SEAN WHITAKER: Sean Whitaker,  
20 Environment and Natural Resources. The first one's  
21 actually to the Board. It's mostly because no one said  
22 where the significance determination is. Where -- what  
23 point in time are we starting from? The GNWT needs to  
24 know.

25 Are we starting from beginning of mine

1 life to determine the significance determination, or is  
2 it when the Proponent filed their application? So  
3 we're hoping for some clarification where significance  
4 determination is going to be determined from, what  
5 point in time.

6 MR. SIMON TOOGOOD: Thanks for the  
7 question. It's Simon Toogood. We're just going to  
8 have a brief discussion, and we'll get back to you on  
9 that one.

10 DR. KATHY RACHER: Kathy Racher, for  
11 the Board. In the meantime, does anyone have any  
12 questions? I'm going to ask the people in the room  
13 about the groundwater model first. And for you --  
14 those on the phone, don't worry. I'll ask you as well  
15 after we go through the room.

16 Any questions on the groundwater model?

17 MR. RICK WALBOURNE: Rick Walbourne,  
18 GNWT. Actually, I have a couple of comments/questions  
19 on the overview presentation, if we can do that.

20 There was a comment regarding Snap Lake  
21 being safe to drink. My -- I guess an overarching  
22 question is: Is there a Canadian drinking water  
23 guideline for TDS, and what is it? And how does that  
24 compare to Snap Lake?

25

1 (BRIEF PAUSE)

2

3 DR. PETER CHAPMAN: Peter Chapman here.

4 Basically, there is no environ -- sorry, Health Canada

5 guideline in terms of, you know, a level of TDS that

6 could adversely affect health. There is a guideline,

7 and I can't remember what it is -- we can get back to

8 you on that -- in terms of taste, because of course

9 salty water will taste differently than freshwater.

10 MR. ZHONG LIU: I guess it's the 500

11 milligram per litre; 500 milligram per litre.

12 DR. KATHY RACHER: Kathy Racher for the

13 Board. That was Zhong Liu, from SLEMA.

14 Do you have any follow-up questions,

15 Rick?

16 MR. RICK WALBOURNE: Rick Walbourne,

17 GNWT. So the 500 milligrams a litre is the taste,

18 palatability? Okay.

19 I just had one (1) more question. There

20 was mention of clear water versus dirty water coming

21 from the underground. You did mention that there was

22 trace amounts of TSS.

23 I was just wondering what the actual

24 numeric value on that was, what kind of levels of TSS

25 in lake clear water versus dirty?



1 MS. ERICA BONHOMME: In the clear -- we  
2 do measure the TSS in -- as using turbidity. So in the  
3 clear water, we have less than 7 NTUs.

4 DR. KATHY RACHER: Kathy Racher.  
5 Question from Sean?

6 MR. SEAN WHITAKER: Sean Whitaker,  
7 Environment and Natural Resources. Just in terms of  
8 your turbidity measurement, has that been correlated to  
9 the clean and dirty? Like is there a correlation  
10 between turbidity and TSS to calibrate your model, or  
11 is it an ASTM, or is it just based on an in-field  
12 measurement?

13 MS. JULIE L'HEUREUX: Julie L'Heureux.  
14 Can you repeat the question? I was busy.

15 MR. SEAN WHITAKER: Sean Whitaker,  
16 Environment and Natural Resources. So you said that  
17 you're using turbidity as your measurement for clean  
18 and dirty water.

19 Has that been calibrated to TSS to have  
20 the positive correlation?

21 MS. JULIE L'HEUREUX: Julie L'Heureux.  
22 Yes. We do have the analysis from the lab, from the --  
23 I mean for the -- the TSS, so we can pull it out for  
24 you and -- and give you -- for the moment, I don't have  
25 the data over my head, but we can certainly find it out

1 before the end of this session today.

2 MR. ZHONG LIU: Zhong Liu, from SLEMA.  
3 Based on my observation, there is nowhere clear  
4 correlation, at least for the past few years, from my  
5 observation.

6 MS. ERICA BONHOMME: We do -- Erica  
7 Bonhomme. We do monitor TSS as part of our  
8 Surveillance Network Program, so I can get you that  
9 number. We don't actually specifically separate out  
10 clear water from our dirty water in our Surveillance  
11 Network Program. So maybe I -- I just -- I'm just  
12 trying to understand sort of the context of the  
13 question.

14 We do obviously treat for TSS all  
15 throughout, but maybe -- maybe give me a bit more to  
16 work with here, what you're -- what you're trying to --  
17 what you're trying to get at here.

18 MS. JULIE L'HEUREUX: Just -- just a  
19 moment. Yeah, this presentation is about the  
20 groundwater flow. It's more like the quantity. So if  
21 you have question about the quality, there's another  
22 presentations going further. So we can probably answer  
23 your question on this -- on these ones.

24 MR. RICK WALBOURNE: Rick Walbourne,  
25 GNWT. Yeah. No, I understand that. It was -- it was

1 mentioned in the overview presentation. That's where -  
2 - where this line of questioning came from. But  
3 obviously there's going to be a lot of conversations  
4 about water quality over the next couple of days. So,  
5 yeah, we can -- we can table that for now.

6 MR. TODD SLACK: Todd Slack, with the  
7 Yellowknives. Excuse me. I've -- I've got three (3)  
8 questions, and the first is a simple one.

9 This TDS for palatability limit, can you  
10 -- can somebody tell me where that limit or that  
11 guideline comes from?

12

13 (BRIEF PAUSE)

14

15 MR. TODD SLACK: Okay. Never mind.  
16 There -- our friends beside me here have provided it.  
17 It's from Health Canada. Thank you for that.

18 Turning to slide 4 in this model, this  
19 is just in the overview, in terms of the -- the  
20 engagement. Is the project's viewpoint that all of  
21 these engagements were relative to the -- the  
22 submission that we're talking about today -- or, sorry,  
23 were relevant, not -- relevant to this discussion that  
24 we're having today? Pardon me.

25 MS. ERICA BONHOMME: Erica Bonhomme.

1 They are all relevant to this discussion. They were  
2 not all specific to this discussion.

3 MR. TODD SLACK: I'm wondering if the -  
4 - in that case, I'm wondering if the project will be  
5 able to undertake an Information Request, if possible,  
6 to provide references from Volume I for these  
7 particular submissions in which TDS was discussed.

8 MS. ERICA BONHOMME: I -- I -- Erica  
9 Bonhomme. I don't think we need an IR. I'll -- I'll  
10 answer that right now.

11 So we did file an -- an engagement plan,  
12 which details all the engagement that was undertaken in  
13 -- last year and in prior years that's relevant to  
14 this. The specific engagement activities where not --  
15 where the water licence amendment application was  
16 discussed is the January 6 session that you see there,  
17 one (1), two (2), three (3), four (4), five (5), sixth  
18 bullet down.

19 We did have a specific information  
20 session that De Beers hosted -- you were present, Todd  
21 -- on the -- on the application. And Dr. Chapman gave  
22 a very good overview of -- of the site-specific water  
23 quality studies that were done in support of that  
24 application.

25 And, more recently, we provided an -- an

1 overview of the application, including the aspects  
2 related to TDS, at a -- a session we had here in  
3 Yellowknife, which you were also present at, on March  
4 20th.

5 MR. TODD SLACK: Yeah. Thanks. And I  
6 -- I was at those. So would you say it's fair to say  
7 that the first few bullets on this list weren't  
8 particularly relevant to TDS or the issues that we're  
9 talking about today?

10 MS. ERICA BONHOMME: Erica Bonhomme. I  
11 -- I would disagree that they're not relevant. They  
12 were not specific to -- to TDS. At that time, we were  
13 still developing the studies that were -- that were  
14 going to support the application. What we've talked  
15 about consistently is water quality in Snap Lake, how  
16 we manage water at Snap Lake, the kind of challenges we  
17 have with managing large volumes in particular, and the  
18 kind of monitoring that we undertake to ensure that we  
19 stay within our -- our licence limits.

20 What has been discussed is the -- the  
21 kind of methodology that we use to do the tex --  
22 toxicity testing, so specific to fish species. So we  
23 do need to get a research licence that allows us to  
24 take fish for scientific purposes. And that's all part  
25 of the work that was undertaken in 2013.

1 MR. TODD SLACK: And the -- I'll move  
2 on, the third point that I -- or third question that I  
3 have. So it seems like the geological base mapping  
4 that formed part of the modelling start-up phase, it  
5 seems like that may not have been the best mapping in  
6 the world.

7 What level of confidence should we have  
8 in the geological mapping for the future? And has De  
9 Beers undertaken additional effort, with this in mind  
10 specifically, to try and have a better idea of where  
11 these faults and structures are?

12 MS. JULIE L'HEUREUX: Julie L'Heureux.  
13 We have SRK, Wayne Barnett. He's a well-known  
14 geostructural engineer who's coming on site for a  
15 month, doing field work and do an update every year.  
16 So we're going to have an update for this year in a few  
17 -- few weeks -- few months.

18 So now what he's doing, it's on top of  
19 mapping everything that had been done for the last year  
20 and -- and confirming all those -- those structures.  
21 He's also taking, you know, geophysical data on surface  
22 to extrapolate the -- the structures that he sees, and  
23 map every year.

24 So we intend to keep this very technical  
25 team on board to help us with our structure at Snap

1 Lake.

2 MR. TODD SLACK: Todd Slack with the  
3 Yellowknives. I'm just wondering, can you clarify, is  
4 that new work that's being undertaken, or has that been  
5 undertaken in the last few years?

6 Can you give me some more information in  
7 terms of the level of effort, please?

8 MS. JULIE L'HEUREUX: Yeah. It's the  
9 third year in a row that they are coming on site on a  
10 yearly basis. The work was done in December this year,  
11 so we -- we're waiting for the report shortly. And, as  
12 mentioned, there's a fund for that on a yearly basis to  
13 make sure that our geologists are doing a good job, and  
14 they're a third-party reviewer on this specific work,  
15 scope of work.

16 MR. TODD SLACK: Thank you. And then  
17 one (1) last question. Would you say that the area of  
18 focus attached to that is an area like close in  
19 proximity to the mine or the active mine workings now?

20 Like, is it looking at what you're doing  
21 one (1) year in advance, or is it looking at five (5) -  
22 - like, I'm trying to understand the predictive value  
23 of the model and the level of uncertainty.

24 MS. JULIE L'HEUREUX: Yeah. Julie once  
25 again. So what -- you know, you saw those big

1 structure, like the main fault, Crackle Fault and  
2 Snapple (sic) Fault. So he's going to go and assess,  
3 and then we can extrapolate.

4 So obviously, he's taking the core, the  
5 rock that the geologists and the -- the drillers have  
6 been doing for the year, and then he's going to go  
7 through all the core box and -- and then extrapolate  
8 the -- the structure, and also going on the face and  
9 then map directly.

10 So there's different ways to make sure  
11 that we are seeing a particular fault, and then we --  
12 we can say, Okay, this is Snap Lake Fault, or Snap  
13 Fault, and then, you know, go from there. So there's  
14 some structures that are known, and then we're just  
15 confirming it, which sense, which estimate is going  
16 yearly just to get more confidence.

17 MR. TODD SLACK: Okay. Thanks. So,  
18 yeah, he's in the -- the known workings and the known  
19 activity. But is he also working in the -- in terms of  
20 the real aspects?

21 Is it outside of the blue line, that  
22 Snap Lake boundary, where the mine is going to go in  
23 the future, or --

24 MS. JULIE L'HEUREUX: Well --

25 MR. TODD SLACK: -- does it provide



1 value five (5) years down the road? Does it provide  
2 value ten (10) years down the road? That's --

3 MS. JULIE L'HEUREUX: The only value  
4 that we can have is with the drilling programs that we  
5 do. So we have the data that -- where we're drilling.  
6 So this is the -- the program that we -- we do on extra  
7 to understand where the structure are, the delineation  
8 programs. That's what we can do.

9 And then, if we looking for the life of  
10 mine area, obviously the 2028, the -- the drills cannot  
11 reach that far. And so what we do is we take the  
12 geophysical data and then add it as a layer to the  
13 physical interpretation.

14 DR. KATHY RACHER: Kathy Racher, for  
15 the Board. I guess I had similar questions to Todd  
16 with respect to the certainty of the model, obviously.  
17 The original model under-predicted the quantity of  
18 water and the quality of the -- of the mine water by --  
19 by a fair amount.

20 And so I think, overall, there's just  
21 sort of a general -- what's different today? Why --  
22 you know, so you've -- you've predicted out to, you  
23 know, 2028, you know. How much confidence should we  
24 have now versus, you know, the confidence we might have  
25 had later?

1 Like, what -- what is different?

2 DR. HOUMAO LIU: Houmao Liu. To answer  
3 your question, it's -- there's some assumption that in  
4 2011's model used in the -- in the model, it's -- we  
5 assumed that --the other consultant who do the model  
6 assumed that all the grouting will be effective. So  
7 every structure you encounter would just achieve the  
8 grout, effective grouted.

9 And that's -- now we go back to the  
10 model, just see what's the history of the model. In  
11 2001, a test got did of model. We assume everything  
12 will be grouted, all the structure will be grouted. We  
13 gather inflow rate of mine discharge about 25,000 cubic  
14 metre per day. And now, in 2011, the same assumption,  
15 we came up with 28,000 cubic metre per day.

16 Okay. Now, to go back to history of  
17 some other model, like 2005, 2006, when a test got did  
18 the model. You know, one (1) time we predict about  
19 62,000 cubic metre per day. And at the other time, we  
20 predicted about, you know, fifty (50) to like 90,000  
21 cubic metre per day. And it's all within the range of  
22 even this update model.

23 So the consistency of the model, I think  
24 you need to take into the consideration all the  
25 assumption they use in the model. The assumption just

1 say grouting is effective, but it's -- it's proven it's  
2 not feasible or it's a challenging task.

3 MS. JULIE L'HEUREUX: Yeah. If I can  
4 just add to that, just to confirm, so we have two (2)  
5 different situation: a situation that all the structure  
6 would be grouted, so our full curtain. And we had two  
7 (2) different team of expert that assessed that this  
8 year and just give a conclusion that it's not feasible,  
9 it's not achievable.

10 We can -- let's say -- well, just as a -  
11 - an anecdote, they tell me that we can grow pineapple  
12 in Yellowknife and that we can also try to grout one  
13 (1) heading. So we have thousands of heading, and then  
14 we have nine (9) different structures that are all  
15 interconnected. So if we try to grout one (1), then the  
16 water will pressurize and then just pop to another  
17 heading. So we can go for years trying to seal those  
18 heading one (1) at a time, but it's not feasible on --  
19 even for the life of mine. We will still be there in  
20 probably thirty (30) years try to grout all those  
21 different little cracks and fissure and fault  
22 everywhere.

23 So they -- we -- we brought up two (2)  
24 different expert in the world, one (1) South African  
25 teams and one (1) Canadian team, and they just conclude

1 that we can't do a full curtain.

2                   So if we're going back to the model, the  
3 assumptions why they're so different with the twenty-  
4 five (25) kind of megalitre per day, that was assuming  
5 a full curtain would -- would work. But if we going  
6 back and we see from 2001 to 2013, or last year, then  
7 we are in the same range. I mean, in 2005, 62 cubic  
8 metre per day. We are reaching sixty-three (63) this  
9 year. If we looking apple with apple and, you know,  
10 compare the same things, then the model prediction are  
11 not very different.

12                   DR. KATHY RACHER: Kathy Racher, for  
13 the Board. Can you turn off your mic?

14                   Thank you. I'd never heard that  
15 explained before, and that's very, very helpful. So --  
16 so the model that -- that we're working with at this  
17 stage is not assuming that the grouting is going to  
18 work. So this is just -- this is just -- this is the  
19 straight goods.

20                   MS. JULIE L'HEUREUX: Yeah. So just to  
21 add that, so these expert that we brought are coming in  
22 few months to try. We -- we're going to try to  
23 localize certain area to grout as another trial,  
24 because normal cement doesn't work because it's so  
25 salty.

1                   So we're looking at different option of  
2 -- of material like liquid grouting and bismuth, what  
3 would also hold more than five (5) years. So we -- we  
4 look at one (1) heading that was very salty, very high  
5 TDS, and they're going to come and we'll try. We'll do  
6 a pilot test on this as well. So that's something that  
7 we -- we working on at the moment. So we'll try one  
8 (1), and then we'll see how effective, and then we can  
9 move on.

10                   DR. HOUMAO LIU:   Houmao Liu. Just  
11 quick one (1) to answer your question. Yes, the model  
12 assumes there's no grouting.

13                   DR. KATHY RACHER:   Kathy Racher, for  
14 the Board. Are there any questions on the model in the  
15 room? Paul...?

16                   MR. PAUL GREEN:   It's Paul Green, with  
17 ENR. Is there somewhere listed -- like, that's a  
18 fairly significant change in the model, and it's  
19 important for us to understand how these things have  
20 changed.

21                   Is there a listing somewhere that  
22 describes, you know, how the assumptions -- how -- how  
23 the assumptions have changed in the more recent models  
24 compared to the original predictive models? Like this  
25 current model assumes the -- the grouting is

1 ineffective compared to the original ones that assumed  
2 it -- it was very effective.

3 Is there a listing -- because I'm sure  
4 there may be other changes in the assumptions that you  
5 -- you -- that has evolved. Is that laid out somewhere  
6 in -- in the documentation we have?

7

8 (BRIEF PAUSE)

9

10 MS. ERICA BONHOMME: Erica Bonhomme.  
11 We did provide a response to that in -- in -- on March  
12 28th, Mackenzie Valley Land and Water Board Number 7.  
13 And that gives a very general overview of what -- how  
14 the models differ from one another based on the  
15 information that was available at the time.

16 DR. KATHY RACHER: Kathy Racher, for  
17 the Board. Maybe, Paul, if you want to take a look at  
18 that, if you have further questions, you can bring them  
19 up at any time, or if you need further -- further  
20 clarifications.

21 MR. PAUL GREEN: Yeah. Paul Green.  
22 We'll -- I'll have a quick look at this. But in the  
23 meantime, I do have another question what was presented  
24 today on slide 10 of the hydrogeological model one.  
25 Yeah.

1                   So post-January 2018, the green line, I  
2   guess, the inflow of the waste, the footwall inflows,  
3   they begin to decrease. And I'm wondering, why do they  
4   begin to decrease?

5                   DR. HOUMAO LIU:    Yeah. There -- there  
6   are two (2) issue here. One is now the development  
7   started from -- you can see that -- I can't follow  
8   that. I need to state my name. Houmao Liu.

9                   Here you can see now it's almost  
10   corresponded to -- to flat line up there because we  
11   start developing or mining under the permafrost.

12                  And the second is, when you start  
13   decreasing because we start -- you know, the  
14   development of haul drift or waste drift start  
15   development earlier and they stop early, too. So they  
16   -- they stop -- they stop development, and as Julie  
17   probably knows better on the mining, they stop  
18   development 2013.

19                  MS. JULIE L'HEUREUX:   No, '23.

20                  DR. HOUMAO LIU:    Or 2023, I'm sorry.  
21   So that's why it become -- like it start dropping down  
22   here because we don't have further development.

23                  MS. JULIE L'HEUREUX:    So just to  
24   confirm, footwall development will be ending in 2023,  
25   according to the -- the mine plan today updated.

1 MR. PAUL GREEN: It's Paul Green, with  
2 ENR Waters again. Thanks. That -- that helps provide  
3 clarity.

4 With regards to the -- the permafrost  
5 effects, I -- I just wonder about the magnitude of the  
6 change that we're seeing because as -- as the water --  
7 as you follow the line up, you know, from 2004 to, say,  
8 2015, you get a large inflow from -- from surface  
9 water, I guess, recharged. And -- and, you know -- and  
10 you get -- and you see some inflow or some increase as  
11 well with the footwall. And I guess that's driven a  
12 lot by -- by the volume of void (phonetic) development.

13 And so if -- if the primary driver for  
14 the footwall inflows is -- is development volume, and  
15 the volume's not going begin decreasing until 2023, the  
16 magni -- like, it's -- you begin to see a -- the  
17 magnitude of -- of the -- of the downslope post-2018  
18 seems large. Like, it seems to mirror the -- the  
19 decrease in -- due to permafrost, but this is all  
20 groundwater below permafrost.

21 So I would -- wouldn't have thought that  
22 you would see permafrost effects on the footwall  
23 inflows so much. Is that --

24 MS. JULIE L'HEUREUX: Okay. Julie  
25 L'Heureux. So we have -- 10 percent of our water, of



1 our groundwater, is from footwall, okay? That's a  
2 statement. So if we looked -- if we look at this  
3 boundary here -- how do you use it, this one?

4 So we already started to mine not under  
5 the lake. And then we can see the influence as we  
6 speak. Since we're not mining under the lake, every  
7 time we -- we open new headings or footwall that is not  
8 under the lake, then we have connate water for a few  
9 days, and then it just dries, you know.

10 So -- so that's why -- like if you want  
11 to recapture your question, because you see that we  
12 have 50 percent approximately of the -- of the mining  
13 plan that's going to be under the permafrost. And  
14 obviously, we're going to reach sixty-three thousand  
15 (63,000), but this inflow will always be coming from  
16 the lake, you know.

17 It's -- we're never going to be able to  
18 grout those structure that we've done in the -- in the  
19 past. So when we're going to just, you know, continue  
20 developing and mining under the permafrost, then we  
21 will not -- not have that much of inflow any more. We  
22 will only have the inflow that was -- that occur in the  
23 past that we're always going to have to deal with,  
24 since we can't block them or grout them.

25 So we will have to deal with the past

1 inflow, but at least going in the future under the  
2 permafrost in this area, we will only encounter the  
3 footwall water, the -- like what you were saying, the  
4 water that's come from the groundwater flow, not only  
5 from the recharge.

6 Does it clarify it or...?

7 MR. PAUL GREEN: It's Paul Green. I --  
8 I think I understand. So then that would suggest that  
9 -- that there's actually a fairly significant  
10 contribution of the recharge water into the footwall  
11 water volume.

12 Is that so, or is -- is the -- I guess  
13 where -- look -- looking at slide 9, just sort of  
14 conceptually, yeah, like, you know, you get the water  
15 coming from above into sort of -- into the development  
16 headings. Then you've got the -- the --

17 MS. JULIE L'HEUREUX: So 10 percent is  
18 the -- from the groundwater that goes in the footwall  
19 of our total inflow.

20 MR. PAUL GREEN: So 10 percent goes  
21 into the open -- like the open -- the white line, the  
22 bottom white line.

23 MS. JULIE L'HEUREUX: Yes, yes. The  
24 footwall here.

25 MR. PAUL GREEN: Okay. So 10 percent

1 is connate and 90 percent is from recharge.

2 MS. JULIE L'HEUREUX: And then this 10  
3 percent is represented -- whoops -- to the green lines,  
4 this one, okay?

5 MR. PAUL GREEN: Yeah.

6 MS. JULIE L'HEUREUX: So that's our  
7 footwall water. That's the total inflow, the pink one.  
8 So when we're going to arrive -- so also you have to  
9 understand that, you know, even though we stop  
10 development around this area, then the -- the mine  
11 plan, like the long-term planner's going to say, Okay,  
12 are we going to go back to this area and mine where we  
13 were mining five (5) years ago?

14 So it's all depending on the mine plan.  
15 You know, they have sequence of mining. So we all take  
16 that in -- in account to do our -- our predictions.

17 MR. PAUL GREEN: It's Paul Green. I  
18 think I understand. So the pink line is actually a  
19 summation of the footwall. So it's --

20 MS. JULIE L'HEUREUX: Exactly.

21 MR. PAUL GREEN: -- so it's not  
22 independent. It's a summation. I understand now.

23 MS. JULIE L'HEUREUX: Exactly.

24 MR. PAUL GREEN: Yeah. Thank you.

25 MS. JULIE L'HEUREUX: That was a

1 confusion when we tried to present that. I was worried  
2 about that, but it's just to show you that -- how  
3 minimal the 10 percent of the footwall. But the pink  
4 is the summation of the hanging wall and the footwall  
5 together.

6 DR. KATHY RACHER: A question from  
7 Sean?

8 MR. SEAN WHITAKER: Sean Whitaker,  
9 Environment and Natural Resources. So just one (1)  
10 more question about the model and its -- the level of  
11 conservatism with your permafrost.

12 Are you assuming 100 percent the  
13 permafrost will be maintained, or is there a level of  
14 conservatism? Will -- have you accounted for any  
15 degradation of that permafrost regime as you mine into  
16 it?

17 DR. HOUMAO LIU: Houmao Liu. We have  
18 not considered the degradation of permafrost. But as  
19 Julie just said, because here the water, majority of  
20 water, is coming from that recharge or from the lake.  
21 So whether permafrost would degrade or not, it will not  
22 -- it's not recharge into the mine working.

23 MS. JULIE L'HEUREUX: I mean, it's two  
24 hundred (200) -- Julie -- it's 200 metres of  
25 permafrost, so there would no way be any, you know,

1 melting of -- of this structure.

2 MR. SEAN WHITAKER: Sean Whitaker,  
3 Environment and Natural Resources.

4 The only reason that I'm bringing this  
5 up is that there is an overall clima -- climatic change  
6 that's predicted for the Northwest Territories. And  
7 Steve Kocal (phonetic) and a few others have presented  
8 this, and that permafrost is expected to degrade over  
9 time.

10 So if you're mining into that  
11 permafrost, that regime might be changing, and you  
12 don't -- do you know what the ice wedge is and what the  
13 actual characterization of ice in that rock is at this  
14 time?

15 MS. ERICA BONHOMME: Erica Bonhomme.  
16 Two (2) things in response to that. One (1) is, you  
17 know, certainly by the time we stop advancing our  
18 footwall in 2023, we would not have those effects play  
19 a substantial role.

20 The second is that, when you're talking  
21 about ice wedges which are 1 to 2 metres extending from  
22 the surface, absolutely insignificant in the context of  
23 the 200 metres of permafrost that we -- we encounter in  
24 this area -- that we know to exist in this area.

25 MR. SEAN WHITAKER: Sean Whitaker,

1 Environment and Natural Resources.

2                   Then the next part would be because --  
3 what's the average temperature of your mine workings,  
4 and how many levels are you going into that permafrost?  
5 Because you might be affecting the thermal regime.

6                   MS. JULIE L'HEUREUX:    Just to let you  
7 know, we -- oh, sorry, Julie. We -- we did some  
8 testing. We have few bore holes on surface that --  
9 that are still open because we have instrument. So we  
10 try to melt the -- for days, for five (5) days, with  
11 hot water of 90 degrees, tried to melt it to have  
12 access to the instrument.

13                   And I failed last summer to reach those  
14 instrument because, by the time I was pulling the --  
15 the tube of boiling water, it was just already too  
16 late. So the ice would go back. So I could even -- I  
17 could not even retrieve my instrument.

18                   So I'm pretty confident. I mean, it's  
19 200 metres. We have proof of that. So like Erica  
20 mentioned, maybe over a couple of metres around the  
21 surface it would affect, but it would -- I think we  
22 could probably define that 200 metres would never be --  
23 be melting in -- in even a decade or like half a  
24 century.

25                   MR. SEAN WHITAKER:    Sean Whitaker,

1 Environment and Natural Resources.

2                   The -- where this is leading me is to  
3 closure because this will be an open void unless you're  
4 planning on filling it at the end. You're going to  
5 have -- are you going to be mine -- flooding the mine?  
6 Like, what's the closure plan at closure for this?

7                   MS. ERICA BONHOMME:   Erica Bonhomme.

8 As you know, our fill plans -- or maybe you don't know,  
9 but our fill plans are a combination of paste and  
10 water. So at the end of mine life, that void will be  
11 completely filled either by inflow water or a  
12 combination of inflow water and paste backfill.

13                  MR. SEAN WHITAKER:   Sean Whitaker,  
14 Environment and Natural Resources.

15                  And this is -- again, the reason I'm  
16 concerned is the -- the amount of levels that are going  
17 into that permafrost regime. If you have -- if you've  
18 con -- considered 100 percent capture and then you fill  
19 it with water, what's the recharge back to Snap Lake  
20 once it's all reconnected?

21                  Is it possible that -- that you're going  
22 to have recharge back to the bottom of Snap Lake?

23                  MR. HOUMAO LIU:   Houmao Liu. Under the  
24 Snap Lake, it -- it's -- there's no permafrost. So  
25 because the Snap Lake you can see the groundwater, it's

1 -- it's -- there's no permafrost. It's on the outside  
2 of Snap Lake there's permafrost.

3                   And then, with the -- the gradient is  
4 downward gradient from Snap Lake, so you should not see  
5 much of a -- the back -- back -- you know, flow back  
6 into the Snap Lake.

7                   MR. SEAN WHITAKER:   Sean Whitaker,  
8 Environment and Natural Resources. Thanks. Just --  
9 thank you for the answers.

10                  MR. TODD SLACK:   Todd Slack with the  
11 Yellowknives. This hadn't really occurred to me, but  
12 one (1) concern that I have in listening to this  
13 exchange is, at Giant, the idea was to sequester all  
14 the arsenic trioxide underground in the permafrost.

15                  And they found that, within a decade,  
16 that those chambers were no longer what you would be  
17 calling continuous permafrost. They were degrading  
18 within the time span that we're looking at.

19                  Now -- and as it seems clear, that --  
20 that's going to radiate out. And I don't know what the  
21 implications of a few metres around your -- your drifts  
22 and -- and your workings, I don't know what impact  
23 that'll potentially have. But I don't think that you  
24 can be simply dismissive of that potential concern.

25                  So I guess, does that represent -- if



1 you had 10 metres surrounding it, does it represent a  
2 concern? What is the impact of -- are you going to see  
3 more connate water?

4 I guess I'd just like to hear a little  
5 more in terms of the Company's thinking there.

6 MS. ERICA BONHOMME: Erica Bonhomme. I  
7 -- I am going to suggest we're a little bit out of  
8 scope here, if -- if you wouldn't mind. But -- but  
9 just -- the whole issue around closure obviously is  
10 addressed in a whole different forum in the -- in the  
11 Company's closure plan.

12 And -- and I -- I would suggest that, in  
13 the context of what we've filed here, that -- that is  
14 information we -- we haven't presented as part of this  
15 model. It's not -- it's not, to my view -- in my view,  
16 it's not pertinent to, you know, the -- the application  
17 that we're -- that is -- that is before the Board right  
18 now.

19 MR. SEAN WHITAKER: Sean Whitaker,  
20 Environment and Natural Resources.

21 The reason that we're asking is to  
22 determine our sig -- level of significance, the  
23 significance determination. So that's -- because  
24 you're in changing the TDS, this potentially could  
25 affect other areas of the mine.

1                   That's -- we're just -- this is where  
2   some of these questions are coming from. It's to  
3   determine our own level of significance.

4                   DR. KATHY RACHER:   Kathy Racher for the  
5   Board.

6                   Yeah, I have -- I -- I've noticed that  
7   it's not specifically on topic, but this is the first  
8   opportunity people have had to discuss the -- the  
9   groundwater modelling and a lot of new information.  
10   And so I've kind of let it go a little bit because  
11   people need to -- to have a firm grip on the whole --  
12   the whole thing.

13                  I also know that Alan's ready to answer  
14   the question on -- on the significance scope, if -- if  
15   that's a convenient spot. Did you have something else  
16   to say, Erica?

17                  MS. ERICA BONHOMME:   Yeah. Erica  
18   Bonhomme. No, it's -- it's not that we -- we don't  
19   want to answer the question. I just -- I'm having a  
20   little trouble understanding where you're going with  
21   it, so I don't have the context. You're -- you're  
22   throwing a lot of questions at us, and I -- I'm not --  
23   with the context.

24                  And maybe the best places to look at the  
25   water quality that we're going to do, Alison's going to

1 do a model -- a presentation on the water quality  
2 modelling. Maybe once we put all the models together,  
3 we have a chance to go through those, I'll better  
4 understand what you're -- what you're getting at.

5 At -- at the moment, it's not something  
6 I -- I feel that we're under -- understanding your  
7 issue properly and that we're providing the responses  
8 that are going to get us resolution to it. That's all.

9 MR. TODD SLACK: I -- I'm happy to  
10 provide a little context, and I'm also happy if the  
11 Company doesn't want to talk about it; that's their  
12 decision.

13 DR. KATHY RACHER: Sorry, Todd. Could  
14 I interrupt for a sec?

15 MR. TODD SLACK: Sure.

16 DR. KATHY RACHER: What I'd like to do  
17 is take -- Don Hart has a couple of questions on the  
18 groundwater model that -- that are specific. So I'd  
19 like to take those and take a short break, let Alan  
20 speak, and then, you know, the rest of the afternoon is  
21 for you, Todd. We'll -- we'll get -- we'll get back to  
22 your question after that.

23 So, Don Hart, if you're on the line, do  
24 you -- do you want to ask your question at this stage?

25 MR. DON HART: Mike Venhuis is going to

1 ask the question.

2 MR. MICHAEL VENHUIS: Yes. It's --  
3 it's Mike Venhuis here at EcoMetrix. I've just got two  
4 (2) questions. It gets a little bit more into the  
5 details of the -- the model.

6 The first one sort of has to do with  
7 flow. Just -- just for my clarification, one (1) --  
8 one (1) of the updates appears to be that, for example,  
9 the -- the hanging wall, the -- it's now been sort of  
10 separated into a number of different layers with --  
11 with a change in hydraulic conductivity with depth.  
12 And the values used for hydraulic conductivity were  
13 sort of determined through calibration.

14 Is that correct?

15 MR. HOUMAO LIU: Yes. This is Houmao  
16 Liu. It is based on the field omager (phonetic), the  
17 packer testing data. And in the meantime, for  
18 structure zone, geological structure zone, it also  
19 based on the model calibration.

20 MR. MICHAEL VENHUIS: Okay. Mike  
21 Venhuis again. So I -- I think you just answered my  
22 next question, that -- that you had. It's listed that  
23 you have like a hundred and fifty (150) hydraulic  
24 conductivity tests. So do you have some value to sort  
25 of compare against these -- the -- the values used in

1 the model for each of these different layers?

2 So are there field values that sort of  
3 help verify or justify these values that you calibrated  
4 to?

5 MR. HOUMAO LIU: Yes, we do. If you  
6 see -- if you look into our -- our memo and -- it shows  
7 the -- the measure value, and also that, we know, we  
8 put as a probability line there. And the most of the  
9 structure zone, it's within that value, but it's with a  
10 higher -- you know, it's less proba -- probability  
11 happens, so it's larger than most of measure value.

12 So I -- we do compare it to the field  
13 data. And there are four hundred and twenty-six (426)  
14 packer testing data we incorporate in the model, and we  
15 analyse them.

16 MR. MICHAEL VENHUIS: Okay. Thanks.  
17 One (1) more question. This has to do with, I guess,  
18 the -- the TDS value for the -- the footwall. In -- in  
19 your memo, you sort of presented 2012 and 2013 data for  
20 TDS. And it looked like the -- the 2013 data was  
21 consistently higher than the 2012 data.

22 And in your model, you sort of looked at  
23 both the arithmetic and geometric mean values and held  
24 that constant throughout the model.

25 I just -- if you can sort of talk about

1 why -- I -- I guess I'm just thinking you've got your  
2 2013 data, which is consistently higher, why that value  
3 wasn't used rather than a lower value of when you  
4 combine the 2012/2013 data.

5 MS. JULIE L'HEUREUX: Julie L'Heureux.  
6 So we started a dedicated underground monitoring in  
7 2013. So we have much more confidence into the 2013  
8 data. Even though they're higher, this -- that's what  
9 we see. So we have different location. We do it even  
10 still every three (3) weeks, so we have monitoring  
11 points in the footwall and in the hanging wall.

12 So that was also intended to -- to  
13 understand the -- the salinity of the water through  
14 deep -- I mean, with the different levels. That was an  
15 assumed point that we -- we actually -- we actually  
16 found that was not related to -- to deep aquifer zones.

17 So, yeah. So the difference in the 2012  
18 and 2013 is we are just -- what we have at the lab, the  
19 -- the result of the lab. So that's why the update was  
20 also there in 2013 is to make sure that we incorporate  
21 the -- the proper data in our updated model.

22 MR. MICHAEL VENHUIS: Okay. Thank you.

23 DR. KATHY RACHER: Okay. One (1) last  
24 question from Zhong.

25 MR. ZHONG LIU: Zhong Liu, SLEMA. I'm

1 wondering so what you -- your modelling for the  
2 hydrogeological modelling considered the PK paste  
3 backfill?

4 MR. HOUMAO LIU: Houmao Liu. We did  
5 not consider any of backfill in effects. So there's no  
6 throttle impact incorporated in the model.

7 MR. ZHONG LIU: If there's -- if you  
8 consider what will be the -- the impact from back --  
9 backfill?

10 MR. HOUMAO LIU: I think probably it  
11 will reduce the predicted inflow, but I think in  
12 general, based on our experience, that backfill usually  
13 does not have a significant impact to the inflow rate.

14 MS. JULIE L'HEUREUX: If I can just add  
15 -- Julie L'Heureux -- the backfill is not a structural  
16 -- it's not structural at Snap Lake, as you probably  
17 know. It's -- it's only a backfill. So water would  
18 still go through the backfill, so it would not affect  
19 the inflow at all.

20 Like, I mean, it's not like a cement  
21 backfill that would block or impermealize (sic) the  
22 structure. It's just to -- it's just an area that we -  
23 - it's just the backfill are just -- is just there. So  
24 even the water would have -- like the perm -- the  
25 hydraulic permit -- permeability would be lower in

1 these area. The water will still -- would still run  
2 through the material by time.

3 DR. KATHY RACHER: Okay. Kathy Racher  
4 for the Board. I need a break, so we're going to take  
5 just ten (10) minutes and be back at 11:05, please.

6 MS. ANITA LI: It's Anita Li from  
7 Environment Canada. Can I ask a couple of questions?

8 DR. KATHY RACHER: Anita, I will  
9 definitely give you an opportunity right after the  
10 break at 11:05.

11 MS. ANITA LI: All right.

12 DR. KATHY RACHER: Thank you.

13

14 --- Upon recessing

15 --- Upon resuming

16

17 DR. KATHY RACHER: Kathy Racher for the  
18 Board. I believe there's one (1) follow-up question  
19 from -- from Mike from EcoMetrix, and then we're going  
20 to get to Anita's questions from Environment Canada.

21 So, Mike, do you want to go ahead with  
22 your follow-up question.

23 MR. MICHAEL VENHUIS: Sorry. Thanks.  
24 It's -- it's just following up with the question I had  
25 on the -- the TDS concentrations in the footwall. So



1 just from what I got on my response was that there's a  
2 little bit more confidence in the 2013 data, you know,  
3 of TDS concentrations in the -- in the footwall.

4                   Where -- where I'm going at is -- is,  
5 unfortunately, the -- the figure wasn't presented in  
6 the presentation. But in -- in the groundwater report,  
7 it shows the concentrations of -- of TDS in the  
8 footwall from 2012 and 2013. And you can see that the  
9 2013 data is -- is significantly higher than the 2012  
10 data.

11                   And the -- the groundwater model has  
12 used a constant concentration of TDS in the footwall  
13 over the -- the time span. And it does sensitivity  
14 using both arithmetic and geometric mean over those two  
15 (2) years. And -- and the results show that there's --  
16 the model is very sensitive to this concentration.

17                   So I guess I just wanted a little bit of  
18 clarification on why, if -- if the 2013 data is -- is -  
19 - if you have more confidence in it and -- and it's  
20 possibly more accurate, why the 2012 data is included  
21 then in the -- in the pool of -- in order to determine  
22 the arithmetic/geometric mean?

23                   DR. KATHY RACHER: Kathy Racher for the  
24 Board. And -- and before I forget, I've been reminded  
25 everyone needs to say their name. And we can't have

1 discussions going on, no back and forth. You have to  
2 stop and say your name. And people can't have more  
3 than -- as soon as you're done with your mic, turn it  
4 off because it limits the ability of other people to  
5 get on.

6 MR. HOUMAO LIU: Houmao Liu. Yeah,  
7 you're talking about Figure 4 in our report, and as you  
8 can see, because the data -- the limit -- the data in  
9 2013, it's actually within the range of 2000 -- 2012  
10 data, too. And because they are limited data, that's  
11 why we incorporate 2012 data to do the -- it's just get  
12 the broader range that -- using our calculation.

13 MR. MICHAEL VENHUIS: Mike Venhuis here  
14 from EcoMetrix. All right. Okay. Thank you for your  
15 response.

16 DR. KATHY RACHER: Okay. Kathy Racher  
17 for the Board. Anita, do you have some questions for  
18 us from the phone?

19 MS. ANITA LI: Yes. I have a few  
20 questions. On page -- let me see -- page -- sorry,  
21 slide 8, you've shown the concentration from the  
22 hanging wall and the footwall. Those concentrations  
23 are from actual sampling of groundwater?

24 They're not from modelling, right?

25 MR. HOUMAO LIU: Houmao Liu. Yes,

1 that's from the actual sampling from -- from the  
2 sample.

3 MS. ANITA LI: Okay. And I understand  
4 the -- the underground mine collects about 60,000 cubic  
5 metres of water for -- per day. So what percentage of  
6 that is from the hanging wall, what percentage from the  
7 footwall, and what percentage is from the inflow water  
8 from Snap Lake?

9 MR. HOUMAO LIU: Houmao Liu. I think  
10 when you talk about sixty thousand (60,000), that would  
11 be the -- the maximum, right, not -- not under current  
12 condition. That's just to make it clear.

13 And it's about 10 percent is coming from  
14 the footwall and the 90 percent is coming from the  
15 hanging wall. And off those hanging wall, I would say  
16 probably 95 percent is coming out from the Snap Lake.

17 MS. ANITA LI: Okay. Thanks. But I  
18 got that sixty thousand (60,000) from that plain  
19 language summary that you have. What is the current I  
20 guess flow now?

21 MR. HOUMAO LIU: Houmao Liu. Current -  
22 - current flow rate is 43,000 cubic metre per day Erica  
23 presented in the introduction.

24 MS. ANITA LI: Okay. Sorry. I didn't  
25 have the -- the PowerPoint presentation yet. Thank

1 you.

2 And I guess --

3 DR. KATHY RACHER: Can you state your  
4 name again, please?

5 MS. ANITA LI: Anita Li from  
6 Environment Canada. So how deep are you going when you  
7 reach that connate water?

8 MS. JULIE L'HEUREUX: At the current  
9 moment, we're around 600 metres under surface.

10 MS. ANITA LI: Okay.

11 MS. JULIE L'HEUREUX: So we going down  
12 15 percent down.

13 MS. ANITA LI: Okay. And that's when  
14 you will hit the connate water, or do you have that  
15 now?

16 MS. JULIE L'HEUREUX: We have that now.  
17 We -- oh, Julie, sorry. We have that now. We always  
18 going to encoun -- encounter footwall water --

19 MS. ANITA LI: Okay.

20 MS. JULIE L'HEUREUX: -- until we  
21 finish the development of the footwall. So as we  
22 advance, obviously we're going to go deeper. I -- if I  
23 remember correctly, I think we're going to go around 1  
24 kilometre above (sic) surface. So we're around six  
25 hundred (600) at the moment. It's rough numbers.

1 MS. ANITA LI: All right. Thank you.  
2 That's all for me.

3 DR. KATHY RACHER: Kathy Racher for the  
4 Board. Okay. Zhong has another question.

5 MR. ZHONG LIU: Zhong Liu from SLEMA.  
6 Could you go back -- go to slide 11? The title is the  
7 Calculated and the Measured TDS. Just here I need a  
8 clarification here because in our SNP report and also  
9 for calculate the TDS is a different idea because it's  
10 calculated from component of TDS.

11 Here, I guess the TDS -- calculated TDS  
12 is kind of -- you know, it's different. It's geo --  
13 geometric mean or ari -- arithmetic mean -- mean,  
14 right? It's not -- because this idea in SNP report is  
15 cal -- calculated TDS and also measured TDS. So I  
16 guess that's a different idea, and I wanted  
17 clarification here.

18 MR. HOUMAO LIU: Houmao Liu. I just  
19 want to explain what is here meaning it says here, what  
20 does TDS calculating mean. We used the, as I said,  
21 volumetric mixing based on the predict of flow seepage  
22 rate to the footwall and to the hanging wall. And then  
23 we used the concentration that -- based on that  
24 measure, TDS concentration, from the groundwater in --  
25 in footwall and of hanging wall, then do the

1 calculation.

2 And because there are two (2) kind of  
3 approach to calculate the mean concentration, we used  
4 one (1) way to calculate the groundwater TDS  
5 concentration using geometric mean of all the measure,  
6 all the water sample that collect in the just ambient  
7 groundwater, and the other one, using arithmetic mean.

8 So this is actually that what we mean  
9 calculate. You can also say it's like predicted for  
10 the future. And the measure one is the one that --  
11 that -- from the lab that measure from the -- the value  
12 actually from underground mine discharge.

13 DR. KATHY RACHER: Kathy Racher for the  
14 Board. So to answer your question, Zhong, it's -- the  
15 -- in this case, it's not calculated based on major ion  
16 concentrations as it would be from a lab sample.

17 Okay. I'd like to move on to the next  
18 set of presentations, but before I do, Alan wanted to  
19 answer the question that came from ENR earlier.

20 MR. ALAN EHRLICH: Thanks. I -- I had  
21 to clarify the question a bit on the break, just to  
22 make sure that I'm answering the right thing. So it's  
23 Alan Ehrlich for the Review Board, and I'm -- I'm  
24 responding to a question that was put out earlier by  
25 Sean Whitaker from GNWT.

1                   As I understand the question, Sean --  
2 I'm going to ask you to confirm that I've got this  
3 right, you're saying when the Board makes its  
4 significance determinations, is it going to be  
5 comparing what -- what is predicted to happen against  
6 the situation before this project - meaning the  
7 amendments that are being talked about here - against  
8 the world with the project, with these amendments in  
9 place; or is the Board going to be comparing this area  
10 before all of this development -- referring to  
11 everything that's affecting the same value ecosystem  
12 components -- against the world with all this stuff,  
13 including the amendment.

14                   Tell me if I got the question right. So  
15 in other words, it seems to me like you're asking, are  
16 we going to look at project-specific impacts when we're  
17 doing our assessment, or are we also going to look at  
18 cumulative environmental impacts?

19                   MR. SEAN WHITAKER: Sean Whitaker,  
20 Environment and Natural Resources. That is correct.  
21 That was the question as I stated it.

22                   MR. ALAN EHRLICH: Okay. Thanks. That  
23 helps. The Board is going to do both, right? We're  
24 required to look at project-specific impacts. And so  
25 when we say 'project-specific' here, we're obviously

1 not including everything having to do with the Snap  
2 Lake Mine, we're including the stuff that's defined as  
3 part of the project.

4                   So we'll look at what are the changes  
5 that are going to be caused by this project, and in  
6 making significance determinations, there'll be some  
7 judgment of the acceptability of these things based on  
8 -- on the subjective, informed judgment informed by the  
9 evidence in the informed opinions of our Board members.  
10 So that's for this project.

11                   But we're also going to look at the  
12 cumulative effects of this project in combination with  
13 all the relevant past, present, and reasonably  
14 foreseeable future stuff. Section 117 of the MVRMA  
15 says we've got to -- Appendix I think it's H of our EIA  
16 guidelines spells out how we do that.

17                   And we're going to consider, you know,  
18 real-world overall changes, not just this project, but  
19 this project in context. Is it adding to things that  
20 are already going on there? Are there things already  
21 going on there that might reduce some of the impacts of  
22 what's proposed here? So we will look at big-picture  
23 stuff.

24                   And you're nodding, so I think you just  
25 wanted that confirmed on the record. I'm pretty



1 confident that De Beers has been clear on that, too.  
2 If anyone's unclear on it, it'd be great if you -- if  
3 you raised that right now. Thanks.

4 MR. SEAN WHITAKER: Sean Whitaker,  
5 Environment and Natural Resources. Thank you for that  
6 clarification.

7 DR. KATHY RACHER: Okay. Kathy Racher  
8 for the Board. Are you ready to continue on with your  
9 presentations?

10 MS. ERICA BONHOMME: Absolutely. I'll  
11 just introduce Alison Snow from Golder Associates.  
12 She'll be talking about the site model and the lake  
13 model.

14

15 PRESENTATION - MODELLING

16 MS. ALISON SNOW: That's, Erica. Good  
17 morning, everyone. My name is Alison Snow. I'm a  
18 water quality modeller at Golder Associates, and I'm  
19 going to be discussing the modelling that Golder  
20 completed for the Snap Lake Mine.

21 The first presentation that I'm going to  
22 be discussing is the site water balance and water  
23 quality model. This is slide 2, and this slide shows  
24 the modelling work that was completed for the Snap Lake  
25 Mine and how the models link together.

1                   And this slide is going to be repeated  
2 throughout each presentation, and the model that I'm  
3 discussing is going to be highlighted. So, as I said,  
4 I'm going to be discussing the site model and just the  
5 linkages to the site model.

6                   So from the groundwater model, mine  
7 water is discharged to the water treatment plant. So  
8 that's the link from the groundwater model to the site  
9 model.

10                  And then the purpose of the site model  
11 is to predict the quantity and quality of water that is  
12 discharged from the mine site to Snap Lake. So that's  
13 the linkage right here from the site model to the Snap  
14 Lake model.

15                  Slide 3. This slide shows a diagram of  
16 the key components of the mine site and the main  
17 process flows that connect the components. And the  
18 water quality component of the site model calculates  
19 water quality at each of the key components of the site  
20 model.

21                  So the key components include the  
22 underground mine, the water treatment plant, the water  
23 management pond, the north pile, the process plant, the  
24 sewage treatment plant, and Snap Lake.

25                  So slide 4 shows some of the water

1 quality constituents that were included in the site  
2 model. And we're going to specifically focus on the  
3 parameters from the EA scoping document. So we have  
4 total dissolved solids, chloride, fluoride, sulphate,  
5 and nitrate. And I'd just to note that nitrite was not  
6 simulated in the site model or the Snap Lake model.

7 Slide 5. So this slide shows the four  
8 (4) scenarios that were simulated in the site model.  
9 The four (4) scenarios were based on two (2) mine water  
10 discharges and two (2) footwall TDS concentrations from  
11 the groundwater model.

12 So we've labelled the two (2) mine water  
13 discharges as the lower bound and upper bound. The  
14 lower bound mine water discharge had a predicted  
15 maximum discharge rate of approximately 60,000 cubic  
16 metres per day. And then we also have an upper bound  
17 discharge with a predicted maximum discharge rate of  
18 approximately 96,000 cubic metres per day.

19 And then the two (2) footwall TDS  
20 concentrations that were carried forward into this site  
21 model and discussed previously were 5,728 milligrams  
22 per litre, which represents the arithmetic mean of  
23 monitored TDS concentrations, and 3,490 milligrams per  
24 litre, which represents the geometric mean of monitored  
25 TDS concentrations. And these TDS concentrations are

1 from below the dyke.

2                   So the two (2) mine water discharges  
3 times the two (2) footwall TDS concentrations produces  
4 the four (4) model scenarios that we carried forward  
5 into the site model. And we just labelled these upper  
6 bound scenarios 'A' and 'B' and lower bound scenarios  
7 'A' and 'B'.

8                   Slide 6 shows the key findings of the  
9 water balance portion of the site model. And the key  
10 findings focus on inflows to the water treatment plant.  
11 And as you can see in the figures, mine water dis --  
12 discharge accounts for the majority of flows to the  
13 treatment plant -- to the water treatment plant.

14                   So at least 84 percent of the inflows to  
15 the water treatment plant originate from underground,  
16 followed by the clear groundwater and water pumped from  
17 the water management pond to the water treatment plant.

18                   The water pumped from the water  
19 management pond to the water treatment plant includes  
20 discharges from the north pile. And the water pumped  
21 from the north pile sumps and the site runoff that is  
22 captured in the water management pond, those flows will  
23 peak during freshet.

24                   Slide -- slide 7 lists the key findings  
25 of the water quality portion of the site model. And

1 the key findings on this slide focus on TDS loadings to  
2 the water treatment plant.

3 And as you can see in the two (2)  
4 figures, mine water accounts for the majority of  
5 loading to the water treatment plant, specifically for  
6 total dissolved solids and its constituent ions. So  
7 you can see that mine water accounts for approximately  
8 90 percent of the total dissolved solids loading to the  
9 water treatment plant.

10 And the loadings from the north pile  
11 sumps and from site runoff cap -- captured in the water  
12 management pond, those loadings will peak during  
13 freshet, but for the most part they represent  
14 approximately 10 percent of the loading in both cases  
15 to the water treatment plant.

16 And slide 8. This slide again lists  
17 some key findings from the water quality portion of the  
18 site model. And these key findings focus on nitrogen  
19 loadings to the water treatment plant.

20 And you can see from the figures that  
21 loadings from the north pile and from the site runoff  
22 captured in the water management pond in this case make  
23 up a larger percentage of the loading to the water  
24 treatment plant compared to total dissolved solids. So  
25 upwards of 30 percent of the loadings originate from

1 the water management pond.

2                   So the second presentation that I will  
3 be discussing is on the hydrodynamic and water quality  
4 model of Snap Lake. So slide 10. So again, this slide  
5 shows the modelling work that was completed for the  
6 Snap Lake mine and how the models link together.

7                   As I said, I'm going to continue by  
8 discussing the Snap Lake model, just highlighted. So  
9 Snap Lake receives effluent discharge from the water  
10 treatment plant, runoff and seepage from the mine site,  
11 and also natural inflows from the Snap Lake watershed.

12                   And all of these inflows are predicted  
13 by the site model. So that's the linkage from the site  
14 model to the Snap Lake model.

15                   And then from Snap Lake, there is a  
16 discharge downstream to the downstream lake --  
17 downstream lakes' model. There's also seepage from  
18 Snap Lake to the underground mine as predicted by the  
19 groundwater model. And the purpose of the Snap Lake  
20 model is to predict concentrations of total dissolved  
21 solids, major ions, nutrients, and levels in Snap Lake.

22                   So slide 11. This -- this slide shows  
23 the Snap Lake model grid. So the Snap Lake model is a  
24 three (3) dimensional model, and the grid shows the --  
25 the three (3) dimensions the model is divided into.

1                   The grid is the geometrical  
2 representation of the water body that -- that's going  
3 to be modelled. And in this case, the horizontal grid  
4 resolution is approximately 200 metres by 200 metres,  
5 and the vertical resolution is 1 metre.

6                   So Snap Lake is divided into two  
7 thousand seven hundred and forty (2,740) grid cells,  
8 and the model performs all of the calculations in each  
9 of the grid cells. And the grid also allows the user  
10 to specify where specific inflows enter the lake and  
11 where outflows leave the lake.

12                  So slide 12. This slide shows inflows  
13 to Snap Lake, and these include the -- oh, sorry -- the  
14 effluent discharge, wetland seepage, north pile  
15 seepage, site runoff that's not captured in the water  
16 management pond, and there's also stream inflows. And  
17 the stream inflows represent water that flows into Snap  
18 Lake that does not come into contact with the mine  
19 site.

20                  And as you can see in the figures on the  
21 right side, the effluent discharge to Snap Lake makes  
22 up the major proportion of inflows to Snap Lake. So  
23 greater than 80 percent of the inflow from Snap Lake is  
24 coming from the treated effluent discharge, followed by  
25 the stream inflows and then what I've put up here as --

1 as "Others" that would be the -- the discharge from the  
2 wetland from the north pile, from the site runoff, and  
3 from water management pond seepage.

4 Slide 13. So this slide shows the  
5 outflows from Snap Lake. These inclo -- include the  
6 outflow -- outflow from Snap Lake downstream; seepage  
7 from Snap Lake to the underground mine, which I haven't  
8 shown on the figure but it's in this area, it's where  
9 they're mining underneath Snap Lake; and water pumped  
10 from Snap Lake for domestic use.

11 And again, as you can see, based on the  
12 figures on the bottom of the slide the underground mine  
13 accounts for the majority of outflows from Snap Lake.  
14 So seepage, water from Snap Lake to the underground  
15 mine accounts for approximately or at least 75 percent  
16 of the outflow from Snap Lake. And then followed by  
17 outflow to the downstream lakes.

18 So Slide 14. This slide shows an  
19 example of the model calibration for total dissolved  
20 solids in chloride near the diffusers where the  
21 effluent from the water treatment plant enters Snap  
22 Lake and at the outlet of Snap Lake. So the figures on  
23 the left are for total dissolved -- total dissolved  
24 solids, the top figure is near the diffuser, the bottom  
25 figure is at the outlet of Snap Lake, and the figures



1 on the right are for chloride concentrations. Again,  
2 near the diffuser station and at the outlet of Snap  
3 Lake.

4                   So in the figures, the monitored lake  
5 water quality data is represented by dots and the model  
6 results are represented by the solid line. And the  
7 model calibration period as you can see was from 2004  
8 to the end of 2012. And you can see that there is a  
9 cyclic -- a cyclical annual pattern present in the  
10 model results, so these low portion of the curves  
11 represent the open water season, and the high portions  
12 of the curve represent the ice-covered season. And  
13 that pattern repeats each year.

14                   And this pattern is present because in  
15 the model as the water freezes, we assume that  
16 constituents, for example, TDS, we assume that they're  
17 rejected from the ice. So the water freezes as pure  
18 water and that mass stays in Snap Lake, so the  
19 concentration increases. And that is observed in the  
20 monitored data. As you can see we have a -- a really  
21 good calibration for totally dissolved solids and  
22 chloride.

23                   So Slide 15. So I repeated the slide to  
24 remind everyone of the four (4) model scenarios that  
25 were simulated in the site model and subsequently

1 carried forward into the Snap Lake model. So the four  
2 (4) scenarios were based on the two (2) mine water  
3 discharges. So we have an upper bound discharge with a  
4 maximum discharge of 96,000 cubic metres per day. And  
5 the lower bound discharge with a maximum discharge of  
6 60,000 cubic metres per day. And two (2) footwall  
7 total dissolved solids concentrations, so 5,728  
8 milligrams per litre and 3,490 milligrams per litre.

9                   So Slide 16. So this slide shows the  
10 maximum predicted concentrations near the diffuser  
11 stations in Snap Lake for total dissolved solids,  
12 chloride, fluoride, sulphate and nitrate. These model  
13 results are based on predicted effluent discharge  
14 quality and quantity from the Snap Lake site model  
15 assuming that mitigation to control or limit the  
16 concentration of water quality constituents in the  
17 discharge does not exist.

18                   So maximum predicted TDS and chloride  
19 concentrations near the diffuser stations in Snap Lake  
20 will exceed the proposed site-specific water quality  
21 objectives. And as Erica mentioned earlier, a  
22 site-specific water quality objective applies in the  
23 lake and they are protective of aquatic life. So it  
24 represents a specific concentration of a substance in  
25 water beyond which detrimental effects to aquatic life

1 may occur.

2                   The site-specific water quality  
3 objectives that are appearing in the table here were  
4 proposed in the Water Licence Amendment application  
5 that was submitted at the end of 2013. Dr. Peter  
6 Chapman will be discussing site-specific water quality  
7 objectives further in a presentation later in the  
8 technical session.

9                   So Slide 17. This slide shows an  
10 example of model predictions. So the last slide had  
11 the maximum concentrations that would be observed and  
12 this slide shows model predictions for TDS and  
13 chloride, again, near the diffuser stations and at the  
14 outlet of Snap Lake. And this is a time series  
15 beginning in 2004 and going till the end of the mine  
16 life, which is the end of 2028. And this just shows --  
17 you can see that the -- the site-specific water quality  
18 objectives for total dissolved solids and chloride will  
19 be exceeded.

20                   Again, I'd just like to repeat that  
21 these model results are based on predicted effluent  
22 discharge quantity and quality from the Snap Lake site  
23 model assuming that mitigation to control or limit the  
24 concentration of water quality constituents in the  
25 discharge to Snap Lake does not exist.

1                   So the key findings from this modelling  
2 in all four (4) scenarios TDS concentrations are  
3 predicted to exceed the proposed site-specific water  
4 quality objective to 684 milligrams per litre near the  
5 diffuser stations and at the outlet of Snap Lake.

6                   Chloride concentrations are predicted to  
7 exceed the proposed site-specific water quality  
8 objective of 388 milligrams per litre in three (3) of  
9 the four (4) scenarios. However, concentrations of all  
10 nutrients, other ions, and total metals and metalloids  
11 in Snap Lake are predicted to remain below proposed  
12 site-specific water quality objectives. We didn't  
13 specifically present the model results in the  
14 presentation but you can look in our report that was  
15 submitted.

16                  Okay, so Slide 19. So this slide shows  
17 two (2) model scenarios that were considered for the  
18 operational period of the mine assuming that mitigation  
19 exists to control the concentration of constituents  
20 discharged to Snap Lake.

21                  So the model scenarios assumed that  
22 mitigation would be in place such that TDS  
23 concentrations in the effluent discharge to Snap Lake  
24 would not exceed 684 milligrams per litre. And we  
25 assumed that it would not exceed 684 milligrams per

1 litre beginning on January 1st, 2015.

2                   And we labelled the two (2) scenarios  
3 "Base Case A and B." Base Case A assumes the lower  
4 bound mine water discharge and Base Case B assumes the  
5 upper bound mine water discharge.

6                   So Slide 20 shows an example of model  
7 predictions for TDS and chloride near the diffusers  
8 where the effluent from the water treatment plant  
9 enters Snap Lake and, again, at the outlet of Snap Lake  
10 for the two (2) model scenarios. So Base Case A is the  
11 lower bound scenario, and Base Case B is the upper  
12 bound scenario.

13                   So with mitigation in place to meet the  
14 proposed average monthly limit for total dissolved  
15 solids of 684 milligrams per litre depth average  
16 concentrations of TDS and chloride were predicted to  
17 remain below proposed site-specific water quality  
18 objectives in Snap Lake.

19                   And so the final presentation that --  
20 that I will be discussing is on the downstream lakes'  
21 model, so Slide 22. So again this slide shows the  
22 modelling work that was completed for the Snap Lake  
23 Mine and how the models link together.

24                   So the downstream lakes' model, which is  
25 highlighted, receives discharge from Snap Lake. And

1 the purpose of the downstream lakes' model is to  
2 predict concentrations of total dissolved solids in  
3 lakes downstream of Snap Lake.

4 Slide 23. This slide shows current  
5 monitoring of lakes downstream of Snap Lake. So  
6 monitoring has occurred at downstream lake 1,  
7 downstream lake 2, Lac Capot Blanc, and then further  
8 downstream at King Lake.

9 And monitoring has shown that dissolved  
10 salts and nutrient concentrations are above baseline  
11 levels throughout downstream Lake 1, downstream Lake 2,  
12 and up to 5 kilometres from the inlet of Lac Capot  
13 Blanc and as predicted in the EAR. So there was  
14 evidence of effluent from the Snap Lake Mine moving  
15 downstream, and as a result the downstream lakes'  
16 modelling that was completed as part of the EAR was  
17 updated.

18 So Slide 24. This slide shows the lakes  
19 modelled in the downstream lakes' model. And again I  
20 would just like to repeat that the purpose of the  
21 downstream lakes' model was to predict concentrations  
22 of total dissolved solids in lakes downstream of Snap  
23 Lake.

24 So the downstream lakes' model includes  
25 -- we have a Mass-balance Model for downstream lake 1

1 and downstream lake 2. We have a hydrodynamic model  
2 for Lac Capot Blanc. And the hydrodynamic model is  
3 similar to the Snap Lake model that was developed. And  
4 then we have a Mass-balance Model for lakes downstream  
5 of Lac Capot Blanc. And the lakes downstream that we  
6 specifically looked at are represented by the model  
7 nodes and the figures, so the orange dots. So from Lac  
8 Capot Blanc all the way down to Great Slave Lake. And  
9 these nodes -- or the -- these model nodes that we  
10 modelled were the same that were modelled in the E --  
11 in the EAR.

12                   So this slide shows predicted  
13 concentrations of total dissolved solids in downstream  
14 lake 1, downstream lake 2 and Lac Capot Blanc assuming  
15 that mitigation would be in place such that TDS  
16 concentrations in the effluent discharge to Snap Lake  
17 would not exceed 684 milligrams per litre beginning on  
18 January 1st, 2015.

19                   So essentially, the Snap Lake model  
20 results that I showed previously from Base Cases A and  
21 B, those results were carried downstream. And in  
22 downstream lake 1, downstream lake 2, and Lac Capot  
23 Blanc TDS concentrations were predicted to remain below  
24 the proposed site-specific water quality objective.

25                   So Slide 26. So the maximum predicted

1 concentration at the outlet of Lac Capot Blanc for each  
2 model scenario, so for Base Case A and Base Case B, was  
3 carried downstream. This slide shows maximum predicted  
4 TDS concentrations in lakes downstream of Lac Capot  
5 Blanc. So the first column in the table is the  
6 downstream site, and these nodes -- or these node  
7 numbers are the same as the orange dots on the previous  
8 figure and we've just added the lake name where the  
9 model nodes lie.

10 The second column just shows the  
11 distance downstream from Snap Lake. The third column  
12 shows the baseline TDS concentrations. These baseline  
13 TDS concentrations were measured at each one of the  
14 model nodes and these are the same baseline TDS  
15 concentrations that were presented in the EAR.

16 And just to note, the baseline range a  
17 minimum TDS concentration of ten (10) to a maximum of  
18 53 milligrams per litre. And then we have the EAR  
19 predictions and then finally our predictions for Base  
20 Case A and Base Case B.

21 And as you can see, I've got the first  
22 line shaded in blue and the shaded cells indicate where  
23 total dissolved solids concentrations are predicted to  
24 be outside of the baseline range. So as of Site 22,  
25 which lies on Mackay Lake, maximum TDS concentrations



1 are predicted to lie within the baseline range, which  
2 ranges from 10 to 53 milligrams per litre. And as of  
3 Site 22 the maximum predicted concentrations downstream  
4 for Base Case A and B match well with the EAR  
5 predictions.

6 And then the -- the final slide, Slide  
7 27, is just the key findings. So with TDS and the  
8 effluent discharge to Snap Lake less than or equal to  
9 the proposed effluent quality criteria of 684  
10 milligrams per litre, TDS concentrations were predicted  
11 to decrease with distance downstream of Snap Lake. TDS  
12 concentrations in downstream lake 1 and downstream lake  
13 2 and Lac Capot Blanc were predicted to remain below  
14 the proposed site-specific water quality objectives.  
15 And TDS concentration downstream of Lac Capot Blanc  
16 were predicted to be within EAR predictions and the  
17 baseline range at Site 22, which is located on Mackay  
18 Lake and is approximately 44 kilometres downstream of  
19 Snap Lake.

20 DR. KATHY RACHER: Okay. Oh, sorry, go  
21 ahead.

22 MS. ERICA BONHOMME: Erica Bonhomme.  
23 That -- that's it for our modelling presentations.

24

25 QUESTION PERIOD:

1 MS. KATHY RACHER: Okay. Kathy Racher  
2 for the Board. Thank you. That was a very good  
3 presentation.

4 At this stage I wanted to sort of limit  
5 the conversation just to questions around the models  
6 that have been presented and it may go back and forth  
7 through the groundwater model because these things are  
8 all connected.

9 I realize there's been predictions of  
10 what TDS or chloride, et cetera, will be in the future  
11 and we'll talk about that when we get to the Response  
12 Plan section, but at this stage I just wanted to make  
13 sure that everyone understands the -- the models that  
14 have been developed by the Company and to make sure we  
15 get all that evidence on the record.

16 So does -- in -- in that vein does  
17 anyone have a question? Rick from ENR?

18 MR. RICK WALBOURNE: Rick Walbourne,  
19 GNWT. Could you pull up Slide 3 for a second, I just  
20 have one (1) quick question on that. I can't re --  
21 which presentation.

22 Yeah. Can you confirm that the -- it  
23 was my understanding that the sewage treatment plant  
24 discharged directly into the water management pond.

25 That's not accurate?

1 MS. ALISON SNOW: Yeah. Treated  
2 effluent discharges to the water management pond,  
3 correct.

4 MR. RICK WALBOURNE: All right. Well,  
5 thanks for that. Rick Walbourne, GNWT.

6 There were several references to  
7 mitigation -- that your modelling is based on  
8 mitigation, it's unclear to me what exactly you're  
9 proposing as mitigation to ensure that the TDS levels  
10 don't go above your proposed water quality objectives.

11 Could you explain to us what those  
12 measures are and if, whether or not, they are actually  
13 a part of this -- formally a part of this application?

14 MS. ERICA BONHOMME: Erica Bonhomme.  
15 We do have the results of studies into mitigation  
16 options in the TDS Response Plan which was filed as  
17 supporting information to this application. As you  
18 know, the TDS Response Plan needs to be approved by the  
19 Board as well.

20 We do have additional information in  
21 this presentation on the TDS Response Plan that will  
22 give a -- us an update on where we are with studying  
23 some of those mitigating options. Generally, I can say  
24 that we're -- we are looking at conceptual pilot  
25 offsite studies for treatment, different methods for

1 treating effluent water for TDS, and we can also  
2 provide an update that, you know, we've done some  
3 initial -- we've done additional work on -- on grouting  
4 and -- and Julie has spoken to that a little bit  
5 earlier today.

6                   You know, we -- we -- for the scale of  
7 the operation that we have it's largely going to be  
8 ineffective for us to use grouting as a mitigation. So  
9 what we are doing is pursuing mitigation that's based  
10 on treating a portion of the effluent, and I'll speak a  
11 little bit later as to where we are with that.

12                   MR. RICK WALBOURNE: Rick Walbourne,  
13 GNWT. Okay, yeah, so I guess if you're going to  
14 provide some more information on the TDS Response Plan  
15 presentation maybe we can delve into that a little  
16 more.

17                   My final question. You did mention some  
18 downstream modelling, downstream lake 1, 2, and the  
19 other, on Slide 26. Well, no, I guess my question is  
20 you -- your statement at the end there was that you  
21 would not be exceeding the water quality objectives of  
22 six-eighty-eight (688). But the six-eighty-eight (688)  
23 water quality objective is your proposal for Snap Lake.

24                   Are you also proposing to apply that  
25 same water quality objective on those downstream water

1 bodies; and if so, what is your rationale? Thanks.

2 DR. PETER CHAPMAN: Peter Chapman here.  
3 The six-eighty-four (684) that was proposed is based on  
4 site-specific testing with organisms that live in Snap  
5 Lake and would also be found in downstream lakes. So  
6 we're proposing a value that would be protective of  
7 organisms in Snap Lake and downstream.

8 MR. RICK WALBOURNE: Rick Walbourne,  
9 GNWT. That's all for me at the moment, but I might  
10 come back to that. Someone else might have some  
11 follow-up questions in that line.

12 DR. KATHY RACHER: Go ahead, Zhong.

13 MR. ZHONG LIU: Zhong Liu with SLEMA.  
14 I have follow-up questions about that sewage treatment  
15 plant effluent direct to water management pou -- pond.  
16 But I -- I -- so that's Slide 3.

17 Here I believe, based on the current  
18 water licence, that is right, the effluent from sewage  
19 treatment plant should charge to -- dis -- discharge to  
20 water treatment plant, but currently De Beers' practice  
21 is to discharge effluent from sewage -- sewage plant to  
22 water management pond. I believe that may not be  
23 consistent with the requirement of the current water  
24 licence. So I request a clarification from the Board  
25 -- from Water Board.

1 MS. ERICA BONHOMME: Erica Bonhomme.  
2 Yeah, we -- we have a requirement to monitor effluent  
3 at the discharge of the sewage treatment plant, which  
4 is at 02-16(I), we do that. The water does temporarily  
5 go to the water treat -- water management pond before  
6 going back through the water treatment plant prior to  
7 discharge. It -- it just gives us more effective  
8 control over the water that's handled in the water  
9 treatment plant.

10 Erica Bonhomme. And -- and we've  
11 previously discussed this with the inspector and with  
12 the monitoring agency.

13 DR. KATHY RACHER: Kathy Racher for the  
14 Board. I guess there is part of the other amendments  
15 requested for the water licence, we noted there is a  
16 request for change to the -- the condition related to  
17 the sewage treatment plant effluent. And -- and the  
18 Board staff also have questions on that that we'll also  
19 discuss tomorrow.

20 MS. ERICA BONHOMME: Yeah, we do have a  
21 map too of all our SNP stations so hopefully when we  
22 get to that we can -- we can pull that -- I think  
23 there's some confusion over where -- where we monitor  
24 certain things on site, so that might be helpful.

25 DR. KATHY RACHER: Todd, go ahead.

1 MR. TODD SLACK: Todd Slack with the  
2 Yellowknives. I have two (2) questions in terms of the  
3 monitoring.

4 I guess part of it relates -- or sorry,  
5 one (1) of these questions relates to the seepage  
6 coming off North Pile and I noted in the documents that  
7 this is based on the original values used in the EA.

8 Given the challenges that you guys have  
9 had with paste deposition and we're seeing a lot more  
10 slurry rather than paste being submitted, shouldn't we  
11 be using values that have been updated that reflect  
12 current conditions?

13

14 (BRIEF PAUSE)

15

16 MS. ERICA BONHOMME: Yeah -- Erica  
17 Bonhomme. We -- we are using the values from the EA.  
18 We have not updated it based on current seepage from  
19 the north pile. But as we -- if you look at the water  
20 balance overall, the -- the amount coming from the  
21 north pile generally is so insignificant that, you  
22 know, I mean, we're talking about fractions of a  
23 percentage of water that actually come from the north  
24 pile.

25 So, you know, we -- we do have current

1 numbers on that but, again, I -- I'm not sure then in  
2 the context of -- of the -- the water balance model or  
3 any of the predictions that -- that we would expect to  
4 have much of a difference in the result.

5 MR. TODD SLACK: Well, in terms of  
6 clarification, on Slide 8 you note - and this is the  
7 nitrogen loading - you note that the loadings from the  
8 north pile and site runoff are -- represent more, and  
9 it looks -- we're in the 30 percent range, 20, 30  
10 percent range.

11 So are you suggesting that, (a), that's  
12 not significant; or (b), that the north pile component  
13 of that is so -- of that 20 or 30 percent is so small  
14 so that -- such that it doesn't matter?

15 If the latter, can you please provide  
16 clarification as to how much it provides to that level?

17 MS. ALISON SNOW: Alison Snow. I -- I  
18 think we're just a bit confused with what these numbers  
19 represent. So, the numbers that we're using from the  
20 EAR are for north pile seepage directly to Snap Lake,  
21 which is a very small proportion of the inflow to Snap  
22 Lake.

23 These loadings represent water that  
24 would flow through the north pile or run off the north  
25 pile and be collected in the north pile sumps, so those



1 flow rights have been updated. They're not from the  
2 EAR. So we do have -- I didn't discuss it here because  
3 I didn't do the modelling, but we have a  
4 hydro-geological model for the north pile that we're  
5 working on, both 1-dimensional and 2-dimensional to  
6 look at seepage rates from the north pile that seep to  
7 the north pile sumps, and that's what this represents.

8 MR. TODD SLACK: Todd Slack. Thanks  
9 for that clarification. I'm just going to make sure I  
10 understand that both the flows and the expected  
11 concentrations have been updated for the water being  
12 captured?

13 MS. ALISON SNOW: Alison Snow. Yes,  
14 they have.

15 MR. TODD SLACK: Okay. Todd Slack.  
16 Thank you for that.

17 The -- the next question is: Has the  
18 project considered any changes in either of the  
19 explosives management or the amount of explosives that  
20 they're using? I -- I'm just looking to ensure that  
21 there's flexibility in these predictions. Should the  
22 project undertake an operational change that this  
23 operational change doesn't throw this model out of  
24 whack.

25

1 (BRIEF PAUSE)

2

3 MS. ERICA BONHOMME: Sorry, Todd, I'm  
4 just flipping -- Erica Bonhomme here. I'm just  
5 flipping through our Nitrogen Response Plan which does  
6 speak a little bit to what we do; our current practice  
7 is underground.

8 So our main -- main source of nitrogen  
9 is through explosives and so we've looked at various  
10 methods of decreasing the amount of explosives we use  
11 underground, so we've -- we've reduced the number of --  
12 of holes that are used to blast each round.

13 The second thing that we've done is im  
14 -- improve the -- the -- the emulsion mixture for that  
15 so that there's less wastage of the explosive material.

16 I -- I'm not aware of any additional  
17 plans to change our explosive practices. Those are the  
18 best practices we have in place right now.

19 DR. KATHY RACHER: Kathy Racher for the  
20 Board. Could I just be -- just clarify, I'm not sure  
21 exactly what happened there, but the -- the models --  
22 the -- the hydrodynamic water quality model that you  
23 presented is sort of -- it's not based on doing  
24 anything differently than today, right?

25 So all your predictions have been made

1 based on current practices and not involving any  
2 mitigations except for the last little bit that --  
3 like, the models that you've submitted are just based  
4 on current practices? And presumably, you know, if --  
5 if more details were to come out about potential  
6 mitigations, you could -- you'd redo the model  
7 accordingly.

8 Is that kind of what you were getting  
9 at, Todd? I had a "M-hm" from Todd.

10 MS. ERICA BONHOMME: Yeah. Eric  
11 Bonhomme. I mean, Alison has presented the -- the  
12 models with mitigation in place, for example, that  
13 would ensure that we stay below the water quality  
14 objectives that we've proposed. So any additional  
15 mitigation to that would -- would make the models right  
16 now conservative.

17 So, you know, we would -- we would  
18 expect that that -- the -- the models that we've  
19 predict -- the models predict a -- a situation where we  
20 treat or we mitigate to a certain level but anything  
21 beyond that is a bonus.

22 DR. KATHY RACHER: Kathy Racher for the  
23 Board. I'm going to go quickly to the phone, although  
24 there will be time for other questions if people have  
25 them, but I'm going to ask Anita first because I asked

1 Don first last time.

2 Anita, do you have any questions at this  
3 time?

4 MS. ANITA LI: Yeah, I have a couple of  
5 questions. The -- the north pile sumps also discharge  
6 through the underground workings, does it not?

7 MS. ERICA BONHOMME: Erica Bonhomme.  
8 No. The north pile discharges to our water management  
9 infrastructure which ultimately goes to the water  
10 management pond.

11 MS. ANITA LI: Okay. Because in the  
12 Site Water Balance Report I thought there was -- in one  
13 of the tables indicates that it also goes to the  
14 underground workings if it needs to be stored there.

15 DR. KATHY RACHER: And for the record,  
16 that was Anita Li from Environment Canada.

17 MS. ANITA LI: Sorry, Anita Li.

18 MS. ERICA BONHOMME: Erica Bonhomme.  
19 That's in an emergency situation, it is not part of our  
20 -- our normal practice. In -- in either case we would  
21 still have everything report back to our water  
22 management system.

23 MS. ANITA LI: Okay. In your tab --  
24 I'm trying to find that table where you showed the  
25 numbers -- it's Anita Li from Environment Canada.

1                   You showed that you wanted -- you would  
2   like a site-specific water quality objectives of 684  
3   milligrams per litre. In your report, that's -- you  
4   indicated that you want an end-of-pipe discharge,  
5   right? You want this number at end-of-pipe.

6                   So usually site-specific water quality  
7   objectives there's a mixing zone related to it, so I'm  
8   a little confused.

9                   Are you asking for end-of-pipe limits or  
10   are you asking for site-specific water quality  
11   objectives?

12                   MS. ERICA BONHOMME:   Erica Bonhomme.  
13   It -- it's both. We're required to develop or  
14   recommend a site-specific water quality objective which  
15   is a level that's protective of the whole lake. We  
16   don't measure a site-specific water quality objective.  
17   We pick a place where we would measure water quality so  
18   as not to exceed that site-specific water quality  
19   objective. That's our effluent quality criteria.

20                   So our EQC that we're recommending and  
21   proposing in this application is also six-eighty-four  
22   (684). So you'll see that number in some cases the  
23   same. For TDS it's the same. For -- for chloride and  
24   some of the other parameters the EQC is different from  
25   the site-specific water quality objective.

1 MS. ANITA LI: Okay. In this case it's  
2 the same. I'm sorry, Anita Li from Environment Canada.

3 In this case it's the same. So this  
4 six-eighty-four (684) that you're asking for is at the  
5 diffuser? Where are you intending to measure this?

6 MS. ERICA BONHOMME: Erica Bonhomme.  
7 Anita, I -- I think we -- we realize there's some  
8 confusion around this. There's a lot of terms, a lot  
9 of numbers. We will talk about it in the EQC section  
10 of our discussion.

11 But specifically on Slide 16, what you  
12 see is the proposed site-specific water quality  
13 objective. And the reason that this is being shown  
14 here is because we're using this to -- to model not  
15 only the water quality in Snap Lake but also the water  
16 quality downstream.

17 So this site-specific water quality  
18 objective refers to the water -- water as -- quality as  
19 it would occur in all of Snap Lake -- in -- in the  
20 whole Snap Lake. We do measure that under our aquatic  
21 effects monitoring program and we -- we report on that  
22 to the Board.

23 MS. ANITA LI: Thank you.

24 DR. KATHY RACHER: Did you have any  
25 further questions at this time, Anita?

1 MS. ANITA LI: No, that's all for me.

2 Thank you.

3 DR. KATHY RACHER: Okay. Kathy Racher  
4 for the Board. Do you have a question from EcoMetrix?

5 MR. IAN COLLINS: This is Ian Collins  
6 from EcoMetrix. A couple of clarification questions  
7 about the modelling approach.

8 First one to do with slide number 12,  
9 and it's to do with the fact that one (1) stream inflow  
10 has been presented on the diagram and under "other  
11 inflows" other stream inflows are presented.

12 What's special about the one that's  
13 highlighted? Why is -- why is that one being singled  
14 out for -- for special treatment?

15 Like, it -- does it form the majority of  
16 the stream flow into the lake, for example?

17 MS. ALISON SNOW: Alison Snow. It was  
18 only highlighted because De Beers has a monitoring  
19 station where that stream enters the lake, so that --  
20 that stream inflow is actually monitored. And then the  
21 other stream inflows represent the natural inflows to  
22 Snap Lake from the rest of the watershed. And I -- I  
23 applied the other stream inflows at various locations  
24 around the lake I just didn't show it on the diagram.

25 MR. IAN COLLINS: Ian Collins here.

1 Thanks for the -- the clarification.

2 In terms of the -- the approach to the  
3 model, am I right in thinking that those stream inflow  
4 inputs would be placed to match with actual stream  
5 inputs into the lake?

6 MS. ALISON SNOW: Alison Snow. Yes,  
7 they will. Or yes, they are.

8 MR. IAN COLLINS: Ian Collins. Thank  
9 you. Next, if you go to slide 15, although this  
10 effects several other slides as well.

11 I'm curious to know how these two (2)  
12 numbers for the footwall total dissolved solid  
13 concentrations were derived from the numbers that are  
14 actually given in the technical memorandum for the  
15 groundwater from Itasca because in the technical  
16 memorandum we have -- the footwall concentrations are  
17 given as 3,170 milligrams per litre and 6,188  
18 milligrams per litre and not the numbers that are here.

19 So could -- is it possible for you to  
20 speak to how these numbers were derived from those  
21 other Itasca numbers?

22 MS. ERICA BONHOMME: Erica Bonhomme.  
23 We're just taking a pause here.

24

25 (BRIEF PAUSE)



1 DR. KATHY RACHER: Kathy Racher for the  
2 Board. Can I suggest that you can take a look for that  
3 over lunch and we'll -- we'll get back to Ian after  
4 lunch.

5 But in the meantime, Ian, did you have  
6 any other questions?

7 MR. IAN COLLINS: No, I think that's --  
8 I think that's it. Thank you very much.

9 DR. KATHY RACHER: Kathy Racher for the  
10 Board. Okay. I'll -- I'll ask you guys about that  
11 later. We have a couple of hands up right now. Zhong  
12 first.

13 MR. ZHONG LIU: Yeah. I have a --  
14 further questions of -- for drinking water quality,  
15 about TDS. The specific objective from Health Canada  
16 is the 500 milligram per litre. So because the De  
17 Beers right now takes water for domestic use from  
18 Northwest Arm, I'm wondering whether De Beers did some  
19 modelling for Northwest Arm part of the lake.

20 I notice that they only present the  
21 diffuser area and main body and outlet. So I'm  
22 wondering whether there's a mod -- modelling result for  
23 Northwest Arm.

24 DR. PETER CHAPMAN: Peter Chapman here.  
25 So I'm going to address the first part because you were

1 talking about Health Canada and the aesthetic  
2 objective, right?

3                   And I just want to point out that in the  
4 supplemental filing Section 2.1.4 we did provide a  
5 comparison to drinking water guidelines. And I just  
6 want to read into the record -- and this is also the  
7 same wording that's actually in the Health -- Health  
8 Canada page 2, September 1978 updated January 1991,  
9 that basically what happened was there was a panel of  
10 tasters that tasted -- rate -- that rated how well the  
11 water tasted, and anything less than 300 milligrams per  
12 litre was excellent; between 300 and 600 milligrams per  
13 litre was good.

14                   And the reason they ended up with five  
15 hundred (500) is because at five hundred (500) you  
16 start to get scaling and these sort of effects, so they  
17 tied it back down to five (5) -- five hundred (500).  
18 Between nine hundred (900) and twelve hundred (1,200)  
19 is fair; and greater than or equal to twelve hundred  
20 (1,200) is unacceptable.

21                   So the five hundred (500) doesn't mean  
22 that you can't drink the water by any means, it's based  
23 on that panel, and I think you'd agree with that. As  
24 far as the modelling goes and that, I'll pass that on  
25 to my colleagues here.

1 MS. ALISON SNOW: Alison Snow. So yes,  
2 we only predicted -- or we only presented  
3 concentrations near the diffuser in the main basin and  
4 at the outlet of Snap Lake, but we did model the entire  
5 Snap Lake, so the Northwest Arm and the main basin. So  
6 I do have model predications for total dissolved solids  
7 at the drinking water intake.

8 MR. ZHONG LIU: Zhong Lui, SLEMA. How  
9 much is?

10 MS. ALISON SNOW: Okay. So if -- if  
11 there's no mitigation in place the maximum TDS  
12 concentration that we see at the drinking water intake  
13 will be one thousand and twenty-four (1,024). And the  
14 minimum TDS concentration that we would see would be  
15 510 milligrams per litre.

16 And then I also have numbers for the two  
17 (2) scenarios that we ran, Base Case A and Base Case B.  
18 So if mitigation was in place TDS concentrations would  
19 vary between 409 and 445 milligrams per litre at the  
20 drinking water intake.

21 DR. KATHY RACHER: Kathy Racher for the  
22 Board. If -- if you, Zhong, would like something more  
23 specific, maybe you could form that into a specific  
24 Information Request. You can provide that after lunch.

25 Did you have a follow-up? I'm just

1 wondering when to break for lunch here. How many more  
2 questions we -- do you have?

3 MR. SEAN WHITAKER: Sean Whitaker,  
4 Environment Natural Resources. I just have two (2)  
5 questions.

6 The first one is a technical one on  
7 Slide 14. You're showing a periodicity that's  
8 increasing. And have you done a statistical analysis  
9 to see -- so it's your gre -- it's your green line. It  
10 looks like it's getting -- increasing each year and it  
11 looks increasing by a statistical amount.

12 Have you done that prediction to see  
13 what that increase is on that cycle?

14 MS. ALISON SNOW: Alison Snow. No, I  
15 have not.

16 MR. SEAN WHITAKER: Sean Whitaker,  
17 Environment and Natural Resources. I -- I would be  
18 interested to see that.

19 Is that possible to form that into an  
20 Inf -- I can come up with some wording on an  
21 Information Request. I'm just consi -- for -- because  
22 it's a model calibration, it could affect the model  
23 another -- 'til 2028, and I'm just curious what that'll  
24 look like at 2028. If it's even possible to  
25 extrapolate it to that point and just carry on that

1 statistical analysis.

2 DR. KATHY RACHER: Kathy Racher for the  
3 Board. This is just the model calibration basically  
4 because it's just comparing to actual data. So -- I  
5 mean, they do have the -- all the graphs going out to  
6 2029 that -- that carry that on and -- and it shows the  
7 same periodicity in --- in the figures. So I'm not  
8 sure what you're asking for.

9 MR. SEAN WHITAKER; Sean Whitaker,  
10 Environment and Natural Resources.

11 It looks like the peaks are increasing  
12 by a set amount each time and I'm wondering if that's  
13 just from the model. I -- I'm just trying to  
14 understand -- just trying to understand how that's  
15 happened. And it looks like that's by an amount each  
16 time and that might be significant. And I'm just  
17 trying to figure out in the calibration.

18 MS. ALISON SNOW: Alison Snow. I  
19 haven't done any specific stats on the calibration  
20 model results, but if you go back to 6 -- Slide 16 --  
21 or sorry, what was it? The one where the calibration  
22 results? Yeah. Okay.

23 So the peaks that we're seeing they're  
24 influenced by the ice thickness on the lake each year,  
25 and from 2004 to till the end of 2012 we had measured

1 ice thickness data so I included that in the model.

2 And the peaks also depend on the depth  
3 of the lake at the monitoring station that we're  
4 interested in. So near the diffuser or at the outlet.  
5 So you'll see different peaks in different areas of the  
6 lake.

7 So moving forward in the future we see  
8 the same periodicity and what I did was I just assumed  
9 an ice thickness of 1.3 metres from now until the end  
10 of mine life, which represents the average ice  
11 thickness that we've seen in Snap Lake.

12 MR. SEAN WHITAKER: Sean Whitaker,  
13 Environment Natural Resources. That's sort of what I  
14 was getting at. I was just trying to understand how it  
15 was calibrated, and what the -- some of the assumptions  
16 were.

17 Is there anywhere in that model that  
18 that's broken down, your assumptions that you've used  
19 in carrying it forward?

20 MS. ALISON SNOW: Alison Snow. In going  
21 forward making model predications I did specify that I  
22 used an ice thickness of 1.3 metres, but in terms of  
23 the cyclical pattern that we're seeing, I did not  
24 specifically say that it depends on ice thickness and  
25 the depth of the lake, I believe.

1 MR. SEAN WHITAKER: Sean Whitaker,  
2 Environment and Natural Resources.

3 If I could have that as an Information  
4 Request just to see the assumptions that you did make  
5 in that forward predicting in your calibration and why  
6 -- and how you've predicted the periodicity. And even  
7 if it's just getting back to me after lunch, I would  
8 appreciate that. Just a full detailed breakdown, just  
9 so I can understand it. It'll help my understanding of  
10 the model.

11 DR. KATHY RACHER: Kathy Racher for the  
12 Board. That seems like a reasonable request. Is that  
13 okay with you?

14 DR. PETER CHAPMAN: Yeah. Peter  
15 Chapman. We take that on.

16

17 --- INFORMATION REQUEST NO. 1: De Beers to show the  
18 assumptions that were  
19 made in that forward  
20 predicting in their  
21 calibration and how  
22 they've predicted the  
23 periodicity (see  
24 Slide 14)

25

1 DR. KATHY RACHER: Kathy Racher for the  
2 Board. Just while we've got this up here, I guess one  
3 (1) thing I noticed is that the -- the slope of the --  
4 sort of what would be the calibrated area up to 2013 is  
5 one way and then it -- you know, especially for the  
6 upper bound it -- it seems like the -- the rate of  
7 increase of -- of TDS in the lake goes up quite a bit,  
8 the trend, and I'm just wondering if that's got  
9 something to do with the groundwater model or some  
10 prediction or if that's just an artefact of modelling  
11 in general?

12 MS. ALISON SNOW: Alison Snow. So the  
13 -- the rate of increase from -- to -- say the present  
14 till approximately 2016/2017, this is as a result of  
15 the mine water discharge increasing, like, it's going  
16 to peak under the lower bound scenario around 60,000  
17 cubic metres per day in the near future and then it'll  
18 flatten out from there. So that's what that increase  
19 is from.

20 MS. ERICA BONHOMME: Erica Bonhomme.  
21 And -- and if you'll allow me to just skip all the way  
22 back through -- oh, that was quick, eh -- to Houmao's  
23 graph here where we see that levelling off at a certain  
24 point. So this is where the groundwater model ties to  
25 what's going on in the lake.



1 DR. KATHY RACHER: Sean's desperate to  
2 ask one (1) more question, so -- and then we're going  
3 to break for lunch.

4 MR. SEAN WHITAKER: Sean Whitaker,  
5 Environment and Natural Resources. It's -- with  
6 respect to Slides 25 and 26 of the current presentation  
7 you provided numbers with mitigation for the downstream  
8 lakes.

9 What does that look like without  
10 mitigation?

11 MS. ALISON SNOW: Alison Snow. The  
12 model results without mitigation are presented in the  
13 supplemental filing. It's just submitted.

14 MR. SEAN WHITAKER: Sean Whitaker,  
15 Environment and Natural Resources. Just because that  
16 was submitted on Friday I haven't actually looked in  
17 detail at it. I glossed over it fairly quickly on  
18 Friday and just a bit yesterday but ...

19 MS. ALISON SNOW: Yeah, they're --  
20 they're in there.

21 MR. SEAN WHITAKER: That's in there?

22 DR. KATHY RACHER: Kathy Racher for the  
23 Board. Yeah, I think that was going to be a question I  
24 had too, so -- and maybe I missed it as well so I can  
25 take a look at lunchtime. Oh my God, Rick has got one

1 (1) tiny question.

2 MR. RICK WALBOURNE: Rick Walbourne,  
3 GNWT. Yeah, I, as well, have not had a chance to look  
4 at that information. Is there any way we can take a  
5 look at that after lunch? Or do you have any idea of  
6 what -- roughly what those numbers -- what range we're  
7 talking here? TDS in those models without mitigation.

8 MS. ERICA BONHOMME: Erica Bonhomme. I  
9 think we have a number of questions related to that.  
10 It is in the supplemental filing. If you give us a  
11 minute here we can -- we can -- we can get you back a  
12 series of answers around that.

13 DR. KATHY RACHER: Kathy Racher for the  
14 Board. It might be helpful if -- I don't know if  
15 you've got it electronically, if -- if we could put it  
16 up. Maybe -- maybe we can do that after lunch. I just  
17 want to respect lunch schedule more or less.

18 And at that time -- so at that time,  
19 we'll have those up because I -- I agree that it would  
20 be useful to see. And if there's further questions on  
21 the modelling we'll take them then and then move on to  
22 the TD Response Plan.

23 So it's 12:20 now and we want to give  
24 people an hour and fifteen (15) minutes for lunch, so  
25 -- or -- or so, so let's say 1:35 precisely, you know.

1 Because we do everything very precisely here. Maybe  
2 1:36 if you're good.

3 So thank you very much.

4 MS. ERICA BONHOMME: Kathy, just --  
5 it's Erica Bonhomme. If people are really chomping at  
6 the bit, we do have a Figure 2-15, 2-16, and 2-17 and  
7 2-18 of the Supplemental Filing that talks about  
8 downstream lakes without mitigation.

9

10 --- Upon recessing at 12:20 p.m.

11 --- Upon resuming at 1:35 p.m.

12

13 DR. KATHY RACHER: Kathy Racher for the  
14 Board. Looks like everyone's here so we'll start off.  
15 There was a few things from the morning to -- to clean  
16 up first I believe. Erica had some answers to a few  
17 questions.

18 Do you want to go through each of those  
19 or do you want me to go one by one?

20 MS. ERICA BONHOMME: No particular  
21 order. It's Erica Bonhomme. We do have some numbers  
22 for -- the question around TSS and turbidity. I'll let  
23 Julie L'Heureux answer that.

24 MS. JULIE L'HEUREUX: Julie L'Heureux.  
25 So TSS we only have it on the dirty water side, we

1 don't monitor just the -- the clean water, we monitor  
2 the effluent and the dirty. So from the dirty water,  
3 so most of the water, it was between 500 milligram per  
4 litre to 2000, okay. So I just give you a range for  
5 the last year, we look at -- we looked up the data so  
6 this was before the treatment in the water treatment  
7 plant.

8 MS. ERICA BONHOMME: Okay, Erica  
9 Bonhomme. The second question which Alison did answer  
10 a little bit before the break was the TDS  
11 concentrations at the drinking water intake. So Alison  
12 provided some numbers.

13 Did you want to point people to where  
14 they can find that information or -- so maybe the  
15 question is, Alison did provide you some numbers. Did  
16 you want -- did you need more information on that?

17 MR. ZHONG LIU: So far so good for that  
18 number, yeah. But if you could tell me where I can  
19 find for the information that would be better.

20 MS. ERICA BONHOMME: Erica Bonhomme.  
21 So we haven't filed that information which is why I'm  
22 asking if there is something specific that you would --  
23 would want to see.

24 MR. ZHONG LIU: Zhong Liu from SLEMA.  
25 I -- I would like to see some written -- some

1 information from De Beers for drinking water, water  
2 intake and watering results, yeah.

3 MS. ALISON SNOW: Alison Snow. I can  
4 provide, for example, a time series like I've provided  
5 for other stations in the lake. So I can provide a  
6 time series of TDS concentrations at the -- the water  
7 intake.

8 DR. KATHY RACHER: Kathy Racher for the  
9 Board. I think that's the second Information Request  
10 today?

11 MR. MARC CASAS: Marc Casas from the  
12 Mackenzie Valley Land and Water Board. I guess I sort  
13 of have one that was -- was sort of initiated as an IR  
14 but I think maybe was answered and -- and the first one  
15 that I have was to outline the assumptions made about  
16 the periodicity from that graph on page 14 of the  
17 presentation. So that's what we have right now as the  
18 first one and making this the next one Number 2, is  
19 that correct?

20 DR. KATHY RACHER: Kathy Racher for the  
21 Board. I believe that's correct and Sean is nodding  
22 his head, he was the one who asked for that.

23

24 --- INFORMATION REQUEST NO. 2: For De Beers to  
25 provide written

1 information for  
2 drinking water, water  
3 intake and watering  
4 results

5  
6 MS. ERICA BONHOMME: The next one on my  
7 list is we were asked also regarding the assumptions  
8 that were used in the -- the groundwater modelling and  
9 I -- I don't think we can answer that now so, you know,  
10 maybe you could formulate that as a specific  
11 Information Request if it's still valid and we'll be  
12 happy to answer that.

13 DR. KATHY RACHER: Kathy Racher for the  
14 Board. I think talking to Paul on the break, I think  
15 you were -- were assuming you didn't need anything more  
16 on that?

17 MR. PAUL MERCREDI: And then I was  
18 chatting with Julie afterwards and she said she had a  
19 fairly simple table she could provide. It didn't sound  
20 like it would be too much effort for her to provide  
21 that, so, if she can do that that would be --

22 MS. JULIE L'HEUREUX: Yeah, we will  
23 provide a summary table with all the different years  
24 the people that did the model and what was the flow --  
25 predicted flow; that's we have it so. It's a summary

1 table. It doesn't list all the assumptions because you  
2 have access to all the models but we can provide a  
3 summary table.

4 DR. KATHY RACHER: Okay, we'll take  
5 that as Information Request Number 3.

6

7 --- INFORMATION REQUEST NO. 3: De Beers to provide a  
8 summary table with  
9 all the different  
10 years the people that  
11 did the model and  
12 what was the  
13 predicted flow

14

15 DR. KATHY RACHER: And the next one I  
16 think had to do with the -- the numbers for the TDS in  
17 the -- the footwall contributions to the models.

18 MS. ERICA BONHOMME: Erica Bonhomme.  
19 So there were -- there was a question about the numbers  
20 used in the site models versus the numbers used in the  
21 Itasca 2013 -- 2012 report and what we'll -- I'll just  
22 Houmao to provide some clarification on -- on the  
23 numbers and where -- where they're reported.

24 DR. HOUMAO LIU: Houmao Liu. In August  
25 30th, 2013 memo the TDS concentration was used based on

1 measured TDS concentration and after our submittal of  
2 that memo and -- the group decide that it's more  
3 reasonable to use the lab calculated TDS value.

4 And so -- so in October 3rd we issue  
5 another memo but that one was submitted to De Beers and  
6 also to Golder Associate so that's the number we used  
7 in -- in the October memo and it's slightly lower than  
8 what is used in Oct -- in August 30th memo. So that's  
9 the difference.

10 DR. KATHY RACHER: Kathy Racher for the  
11 board. I don't know if Ian Collins is on the line if -  
12 - if you have a comment on that or a follow-up  
13 question?

14 MR. IAN COLLINS: That's fine, thank  
15 you.

16 DR. KATHY RACHER: I believe -- it's  
17 Kathy Racher, Ian said that was fine, thanks. Okay,  
18 great.

19 MS. JULIE L'HEUREUX: Just to confirm  
20 all the slides that were presented was actually  
21 reporting those updated October data.

22 DR. KATHY RACHER: Kathy Racher for the  
23 Board. And I believe the way we left it before lunch  
24 was we were just going to take a look at some of the  
25 graphs and the supplemental material that was submitted



1 last Friday with respect to the downstream  
2 concentrations of TDS in the absence of additional  
3 mitigation on site.

4 So, Erica, if you want to take that  
5 over.

6 MS. ERICA BONHOMME: Erica Bonhomme.  
7 Just for clarification this is the supplemental filing  
8 provided April 11th and we're on Figures 2-15 and 2-16,  
9 page 28. I'm just going to let Alison Snow speak to  
10 that further.

11 MS. ALISON SNOW: Alison Snow. So  
12 Figure 2-15 is showing predicted whole lake average  
13 total dissolved solids concentrations downstream lake 1  
14 and, again, these are assuming that there is no  
15 mitigation in place to control concentrations of  
16 parameters such as TDS in the effluent discharge to  
17 Snap Lake.

18 So the four (4) scenarios, we have lower  
19 bound scenarios A and B and upper bound scenarios A and  
20 B. So that's for downstream lake 1.

21 And then similarly we carried that  
22 downstream to downstream lake 2 and I believe there is  
23 another figure Figure 2-7 -- down a bit further, Figure  
24 2-19. Right. This one here shows the predicted whole  
25 lake average, total dissolved solid concentrations in

1 Lac Capot Blanc.

2 And then we -- we also carried that --  
3 these results further downstream. Scroll down a bit.  
4 I can't remember the figure number. Figure 2-22, I  
5 believe, or -21. Okay, so that's the one we presented.  
6 Okay, so this.

7 We presented it in a figure as opposed  
8 to a table but this shows the results of the downstream  
9 lake modelling nodes for the four (4) scenarios. And  
10 it also presents the baseline range, the dotted black  
11 lines, from approximately 10 to 53 milligrams per litre  
12 of TDS.

13 So for those four (4) scenarios as we  
14 move downstream, again, it's by the first site on  
15 Mackay Lake, which I believe is Site 22, concentrations  
16 are back within the baseline range.

17 DR. KATHY RACHER: Kathy Racher for the  
18 Board. Are there any questions about the -- this  
19 information?

20 MR. ZHONG LUI: Zhong Lui from SLEMA.  
21 I'm wondering whether De Beers also could provide the  
22 modelling results for downstream chloride level change,  
23 you know, and also compare -- compare with the CCME  
24 guideline 120 milligram per litre.

25

1 (BRIEF PAUSE)

2

3 MS. ALISON SNOW: Alison Snow. So for  
4 the downstream lakes' modelling we currently only  
5 modelled total dissolved solids as it moved downstream.

6 What we did -- or what we could do is  
7 just take the -- assume that the percentage of chloride  
8 and TDS remains the same as it is in Snap Lake and  
9 present model results. So the chloride concentration  
10 is 46 percent of TDS.

11 DR. KATHY RACHER: Kathy Racher for the  
12 Board. I think that, yeah, if you could -- if you  
13 could do that. Even using that simplifying assumption  
14 of 40 percent chloride for the TDS rather than me  
15 running the model, I think that would be helpful.

16 And Zhong has asked for -- I mean a  
17 comparison to the CCME Guideline, but I think because  
18 you've proposed a water quality objective that's  
19 hardness-based, it would be helpful to have that  
20 information as well. I mean, we'll see both but the  
21 hardness-based one I'd have to pick up a calculator to  
22 do.

23 So maybe you could do that for us.  
24 Because it -- the hardness will change obviously in the  
25 lakes downstream and so the water quality objective is

1 going to be different for -- for different scenarios  
2 and different lakes downstream. And we could have that  
3 as IR-4?

4

5 (BRIEF PAUSE)

6

7 DR. KATHY RACHER: Apparently, I can't  
8 count and this is probably IR-5.

9

10 --- INFORMATION REQUEST NO. 4: De Beers to provide  
11 the modelling results  
12 for downstream  
13 chloride level change  
14 and also compare with  
15 the CCME guideline  
16 120 milligram per  
17 litre.

18

19 --- INFORMATION REQUEST NO. 5: To provide the  
20 calculations of  
21 chloride in the  
22 downstream receiving  
23 environment and also  
24 the hardness  
25 associated with those

1 downstream

2 environments.

3

4

5 DR. KATHY RACHER: Kathy Racher for the  
6 Board. We'll get our story straight on the numbering  
7 and get back to you, but we will take that as an IR,  
8 though.

9 DR. PETER CHAPMAN: And Peter Chapman  
10 here. Just to check, these IRs if we can do them  
11 sooner, great, but otherwise the deadline on the  
12 schedule is when the IRs are due, correct?

13

14 (BRIEF PAUSE)

15

16 DR. KATHY RACHER: Kathy Racher for the  
17 Board. Yeah, the -- the number on the schedule is  
18 April 30th and that would be the -- the deadline. You  
19 can submit them any time up till April 30th.

20 Okay. Kathy for the Board. Were there  
21 any other questions on the downstream water quality  
22 predictions without mitigations or other things about  
23 the water model?

24 I'll take questions in the room and  
25 then I'll ask people on the phone. So, Rick...?

1 MR. RICK WALBOURNE: Rick Walbourne,  
2 GNWT. I'm not sure if I missed it, but did you also  
3 show the effects or the predictions for Snap Lake  
4 without mitigation? I just caught the end there; I was  
5 reading something.

6 I saw the downstream lakes but was Snap  
7 Lake also provided or did I miss it?

8 MS. ALISON SNOW: Alison Snow. Yes,  
9 the down -- or sorry, Snap Lake with mitigation was  
10 provided. I could -- I'm just looking for the slide  
11 number.

12 DR. KATHY RACHER: Kathy Racher for the  
13 Board. I think Rick was asking for without mitigation.

14 MR. RICK WALBOURNE: Yes.

15 DR. KATHY RACHER: And -- it's Kathy  
16 Racher for the Board again.

17 So that's the -- the hydrodynamic model  
18 that's on the record is -- is all about Snap Lake  
19 without mitigation. So it just doesn't have any of the  
20 -- it doesn't have the downstream information in it, in  
21 that model, that's all.

22 MS. ERICA BONHOMME: Erica Bonhomme.  
23 And -- and in the presentations it's summarized on  
24 Slide 17 of the lake model presentation.

25 DR. KATHY RACHER: Kathy Racher for the

1 Board. Is there anyone on the phone? I'll ask -- I  
2 don't know if Anita's back on the phone from  
3 Environment Canada. If she has any further questions  
4 I'll ask her first.

5 MS. ANITA LI: I am on the phone.  
6 Anita Li, Environment Canada.

7 Sorry, I -- I missed that. The  
8 downstream you did the analysis with mitigation, right?  
9 And the -- up at Snap Lake you said it was page 17 --  
10 Slide 17 that shows it with -- without mitigation?

11 MS. ERICA BONHOMME: Correct. So Slide  
12 -- slide 17 -- it's hard for you to see it in the --  
13 because you're not in the room right now, what -- the  
14 title of -- the title of the presentation is "Snap Lake  
15 Mine Hydrodynamic and Water Quality Model Predictions."

16 MS. ANITA LI: Sorry. Okay, thank you.  
17 I just wasn't sure.

18 MS. ERICA BONHOMME: That was Erica  
19 Bonhomme speaking.

20

21 (BRIEF PAUSE)

22

23 MS. ERICA BONHOMME: Okay, do you -- do  
24 you have that, that slide? Okay. And then -- and  
25 then we move down and slide -- slide 20 of that same

1 presentation provides the modelling wi -- with the  
2 mitigation in place. That was Erica Bonhomme again.

3 MS. ANITA LI: Okay. Anita Li,  
4 Environment Canada. This is the one showing the line  
5 graph, right? I'm on slide 20 and it says "Predicted  
6 Steps Average TSD -- TDS on Chloride Concentration"?

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

9 MS. ANITA LI: Okay. So seventeen (17)  
10 was without -- without mitigation and 20 is with  
11 mitigation? Sorry, I'm trying to figure... Is -- is  
12 that correct? Seventeen (17) is without --

13 MS. ERICA BONHOMME: Correct.

14 MS ANITA LI: -- mitigation?

15 MS. ERICA BONHOMME: Slide 17 presents  
16 the predicted concentrations without mitigation. So  
17 left -- left to their own devices this is how TDS and  
18 chloride concentrations would increase --

19 MS. ANITA LI: Okay.

20 MS. ERICA BONHOMME: -- within Snap  
21 Lake --

22 MS. ANITA LI: Okay.

23 MS, ERICA BONHOMME: -- at the diffuser  
24 and at the outlet of Snap Lake. And sli -- slide 20  
25 presents how concentrations would -- would increase and



1 then level out with the proposed EQC if -- if the  
2 proposed EQC were met.

3 So, you know, we would have mitigation  
4 in place that would ensure that the water quality would  
5 remain below the site-specific water quality  
6 objectives.

7 MS. ANITA LI: Anita Li, Environment  
8 Canada. Thank you.

9 What mitigation was used to develop the  
10 second graph on page 20? Like, what mitigation  
11 measures did you assume in your model?

12 MS. ERICA BONHOMME: Erica Bonhomme.  
13 It -- it's -- it doesn't really matter what mitigation  
14 is applied here. We do discuss that in the TDS  
15 Response Plan. The modelling simply assumes that that  
16 site-specific water quality objective will not be  
17 exceeded.

18 MS. ANITA LI: Okay, thank you. Anita  
19 Li, Environment Canada. That's all the questions I  
20 have.

21 DR. KATHY RACHER: Kathy Racher for the  
22 Board. Thank you for that.

23 If there's anyone on the line from  
24 EcoMetrix, do you have any further questions at this  
25 time?

1 MR. DON HART: No further -- Don Hart  
2 for EcoMetrix. No further questions.

3 DR. KATHY RACHER: Kathy Racher for the  
4 Board. Okay, Zhong...?

5 MR. ZHONG LIU: Zhong Liu from SLEMA.  
6 In slide 17 clear -- clearly indicated lower bound  
7 scenario A, B, upper bound scenario A -- A, B, and --  
8 but in slide 20 there's no scenario. So I assume is  
9 scenario B or scenario A for slide 20?

10 MS. ALISON SNOW: Alison Snow. What I  
11 did on slide 20 is because we assumed the TDS  
12 concentrations in the discharge to Snap Lake would not  
13 exceed 684 milligrams per litre, I only ran two (2)  
14 scenarios. So from 2004 until January 1st, 2015 I only  
15 -- I ran two (2) scenarios: one with an upper bound  
16 flow and one with a lower bound flow and I assumed the  
17 lower TDS concentration. So scenario B concentration.

18 But past that point from January 1st,  
19 2015 onward I usually had to reduce the concentration  
20 to 684 milligrams per litre in the discharge. So there  
21 are -- I could have ran four (4) scenarios but I think  
22 they would have been one on top of the other.

23 DR. KATHY RACHER: Kathy Racher for the  
24 Board. Great. So before we get on to the presentation  
25 of the TDS Response Plan, I think -- if that's where

1 we're going next -- Mark wanted just to run through  
2 however many IRs we happen to have at this stage just  
3 to -- to check that we're on the right track.

4 MR. MARK CASAS: Thanks, Kathy. It's  
5 Mark Casas from the Land and Water Board. So I'll  
6 start with what I have as number 1 through to 5 and  
7 then we can clarify if we have to from there.

8 So the first one I have, as I mentioned  
9 earlier, was to outline the assumptions made on the  
10 periodicity, a graph on page 14, and that came from  
11 ENR. Sean Whitaker, I believe. The IR num -- so  
12 that's IR-1.

13 IR-2, I have here jotted down as -- as a  
14 time series for change in TDS at the water intake.

15 So IR-3, I have as summary table of  
16 predicted flows, which I guess you guys -- sorry, Julie  
17 L'Heureux was -- was speaking about as being able to  
18 submit that.

19 MS. JULIE L'HEUREUX: Historical.

20 MR. MARK CASAS: Hist -- of historical,  
21 yeah. Sorry.

22 IR-4, I have the site models. That was  
23 a question raised by EcoMetrix about the 'A' and 'B'  
24 scenario concentrations and why they differed from the  
25 initial Itasca modelling. Now, I believe that one was

1 -- was confirmed as being answered by -- by Ian Collins  
2 on the phone. So maybe just after I'm -- I'm done  
3 going through we can just confirm that and then I'll --  
4 I guess I'll just strike that one off.

5 And IR-5 was to provide the calculations  
6 of chloride and -- and downstream -- in the downstream  
7 receiving environment and also the hardness associated  
8 with those downstream environments.

9 So maybe first, so Eco -- EcoMetrix, can  
10 you just confirm that IR-4 has been responded to?

11 MR. IAN COLLINS: Ian Collins here from  
12 EcoMetrix. I actually would like to ask if it's  
13 possible for us to see the October Memorandum as  
14 opposed to the August Memorandum for Itasca. That will  
15 help clarify it.

16 MS. ERICA BONHOMME: Erica Bonhomme.  
17 Yes, it is.

18 MR. IAN COLLINS: That would be great.  
19 Thank you.

20 MR. MARK CASAS: Okay. Well, I guess  
21 for fun we'll make that IR Number 6. So De Beers will  
22 provide then the October memo in regards to the site  
23 model concentrations, TDS concentrations. And -- yeah.

24 So if -- if there was anything that I  
25 missed please mention it now so we can get it down and

1 then move forward.

2

3 --- INFORMATION REQUEST NO. 6: De Beers to provide  
4 the October memo in  
5 regards to the site  
6 model TDS  
7 concentrations.

8

9 DR. KATHY RACHER: Okay. Kathy Racher  
10 for the Board. Just to let you know we will be writing  
11 these down and -- and giving them to you in writing as  
12 well. Sean has something to say.

13 MR. SEAN WHITAKER: Sean Whitaker,  
14 Environment and Natural Resources.

15 I just wanted to read it into the  
16 record -- because we are talking about downstream lake  
17 impacts, Section 12.6.4 water quality of the original  
18 environmental assessment in 2002. I'm going to read:

19 "There is no valid linkage for  
20 cumulative impacts associated with  
21 water releases from Snap Lake diamond  
22 project for water quality."

23 I'm going to read that section:

24 "The predicted impacts associated  
25 with the water releases from the Snap

1 Lake diamond project were restricted  
2 to the LSA."

3 The near Snap Lake is what "LSA" was  
4 referring to.

5 "There are no other existing or  
6 planned activities in the LSA that  
7 could impact water quality.  
8 Similarly, there are no other  
9 existing or planned activities within  
10 the RSA,  
11 environment which RSA stands for]  
12 that could impact water quality,  
13 therefore, there are no valid linkage  
14 for cumulative effects of water  
15 releases on water quality and no  
16 further assessment was required."

17 I just wanted to highlight that because  
18 we are talking about downstream changes to water  
19 quality away from the LSA.

20 MS. ERICA BONHOMME: Erica Bonhomme.  
21 We do address, I think, a -- a lot of the information  
22 you're speaking to in the Supplemental Filing that was  
23 filing -- filed on Friday, and we will -- we have a  
24 presentation on that that hopefully we can get to  
25 tomorrow.

1 DR. KATHY RACHER: Kathy Racher for the  
2 Board. Okay, that's fine. That's noted. And in going  
3 forward, you know, if there are things that, you know,  
4 we -- we can't resolve today, of course, you can -- you  
5 can take it up in your technical report to multiple  
6 boards as it turns out.

7 MR. SEAN WHITAKER: Sean Whitaker,  
8 Environment and Natural Resources. I just wanted to  
9 have that read into the record so it is here for both  
10 Boards, as it is the technical session for both.

11 DR. KATHY RACHER: All right. Kathy  
12 Racher for the Board. Erica, we'll go back to you to  
13 carry on with the TDS Response Plan then -- and a  
14 reminder to say your name at the beginning of  
15 everything you say. It's -- it's just be -- for the  
16 purposes of transcription and the poor woman in  
17 Edmonton who has to figure out who said what at the end  
18 of the day.

19

20 PRESENTATION - TDS RESPONSE PLAN

21 MS. ERICA BONHOMME: Okay, the  
22 presentation on the TDS Response Plan follows from the  
23 presentations where we left off this morning. I'm  
24 Erica Bonhomme, I'm the manager of Environment, Snap  
25 Lake Mine, De Beers Canada.

1 Slide 1. The TDS Response Plan is being  
2 submitted as a requirement of the licence. The current  
3 water licence. It was required to be submitted by  
4 December 31st, 2013. We -- we included it as part of  
5 this application submission.

6 There's a couple of requirements within  
7 that licence that I draw your attention to. One (1) is  
8 the licence required us in the TDS Response Plan to  
9 develop and recommend appropriate water quality  
10 objectives for TDS chloride and fluoride in Snap Lake  
11 derived from toxicity testing. And it required us to  
12 recommend EQCs for TDS chloride and fluoride to be  
13 applied at SNP Station 02-17, that's end-of-pipe, that  
14 would ensure protection of aquatic life in Snap Lake.

15 A note that there currently are no  
16 national water quality guidelines for TDS. De Beers  
17 has conducted its own toxicity studies related to TDS,  
18 some of which are ground-breaking. And Dr. Chapman  
19 will speak to that in just a little bit.

20 The conclusions of these required  
21 toxicity studies has led us to recommend site-specific  
22 water quality objectives for Snap Lake and now higher  
23 EQCs for TDS, chloride and fluoride, which is the basis  
24 of our amendment application.

25 Slide 3. The full results of the



1 studies are provided in the following reports that were  
2 also filed with the application: Development of Total  
3 Dissolved Solids Chronic Effects Benchmark; and  
4 Development of Fluoride Chronic Effects Benchmark both  
5 for aquatic life in Snap Lake.

6               Recent supplemental toxicity testing  
7 specifically for daphnia magna suggests that even  
8 higher site-specific water quality objectives than  
9 proposed in the application for TDS may be appropriate.  
10 And those results are provided in a technical memo that  
11 was filed on Friday called "Technical Memo: Results of  
12 Second Daphnia -- Daphnia Magna Toxicity Test Results."

13               Now we believe that a TDS EQC which is  
14 inclusive of chloride, fluoride and sulphate would be  
15 protective of the aquatic environment. So TDS EQC all  
16 by itself in other words.

17               De Beers has high confidence that the  
18 current proposed EQCs and site-specific water quality  
19 objectives will ensure protection of the aquatic  
20 environment. However, we would like the opportunity to  
21 present additional evidence during these proceedings  
22 specific to TDS and as they relate to the additional  
23 testing that we've just completed.

24               I'll give a -- I'll -- I'll start with  
25 an overview of the other requirements of -- or how

1 we've responded to the other requirements of the TDS  
2 Response Plan. In particular, the identification of  
3 TDS sources and how we'll manage those -- the -- the  
4 TDS from -- from those sources.

5           The assessment and quantification of  
6 sources of TDS loading in mine water is based on  
7 results from the Snap Lake water quality report and  
8 groundwater model scenarios which we discussed this  
9 morning.

10           The models are updated annually based on  
11 field monitoring data, which is collected as part of  
12 the surveillance network program and aquatic effects  
13 monitoring program. And we've already mentioned the --  
14 the percentages of loading of TDS from underground and  
15 how it relates to mine development.

16           The current practices for minimizing  
17 groundwater seepage to the underground which are  
18 largely inconsequential in stopping loading of TDS are  
19 to conduct cover hole drilling to ensure we identify  
20 high flow -- potential high flow zones and grouting,  
21 which Julie has -- Julie L'Heureux has mentioned  
22 earlier this morning in terms of our efforts to use  
23 that as a -- a solution to provide temporary and  
24 partial reduction to flow.

25           The TDS Response Plan provides a summary

1 of the investigations we've completed to date and to  
2 minimizing TDS loadings to the environment. De Beers  
3 commissioned pre-feasibility desktop studies of the  
4 effectiveness and possible capital and operating costs  
5 of known water treatment technologies. These are  
6 reported in the TDS Response Plan and they're listed  
7 there. I'm on Slide 5 for those on the phone.

8                   We have also looked at reviewing the  
9 -- we've also looked at the possibility of targeting  
10 footwall water for treatment. And we've al -- while  
11 all this has been undertaken, DBC has wrapped up --  
12 ramped-up -- De Beers Canada has ramped-up handheld and  
13 inline monitoring of groundwater and effluent to gain a  
14 better knowledge of the flow and quality of water.

15                   In the end, the evaluation of the pre-  
16 feasibility studies concludes that some technologies,  
17 including micro-filtration, reverse osmosis, ion  
18 exchange, and evaporation crystallization processes  
19 alone or in combination are potentially feasible for  
20 Snap Lake.

21                   We've also established that treatment of  
22 full mine effluent is not cost effective and that, as a  
23 result, reducing TDS in effluent in order to maintain  
24 the current whole limit which is a whole lake average  
25 below 350 milligrams per litre TDS is not economically

1 feasible, nor is it necessarily practicable for Snap  
2 Lake mine.

3                   We are currently in a concept pilot  
4 testing stage to evaluate -- to further evaluate  
5 options for treating effluent to meet the proposed  
6 site-specific water quality objectives for TDS that are  
7 both practicable and continue to be protective of the  
8 environment. That means that they will ensure that the  
9 water in Snap Lake remains safe to drink and the fish  
10 remain healthy.

11                   Slide 6. So as I mentioned, the concept  
12 pilot testing is underway and we expect a feasibility  
13 decision by Q4 2014, end of this year. The feasibility  
14 will be based on detailed cost benefit analysis and a  
15 decision by this Board or these Boards on appropriate  
16 site-specific water quality objectives.

17                   Generally, the more TDS we remove from  
18 water the higher the amount of waste generated, energy  
19 consumption, greenhouse gas emissions, operating cost,  
20 and infrastructure. Those are all things we're  
21 currently evaluating.

22                   Other things we have to take into  
23 consideration when looking at possible treatment  
24 options are: The reliability of the system, the  
25 scalability of the system, effectiveness,

1 considerations for temporary brine storage, and the  
2 seasonality of road access to Snap Lake mine.

3 Our initial findings show that treatment  
4 can be more than 90 percent effective at removing TDS  
5 from mine water. There is no need to target specific  
6 ions, but we can treat TDS as a whole.

7 Targeted footwall treatment is not  
8 practicable under our current mine operating conditions  
9 and, in fact, it may be most practicable to treat a  
10 percentage of our mine water outflow.

11 Slide 7. So when we are looking at the  
12 effectiveness of treatment in our pilot concept study  
13 we are looking at: TDS, nitrate, nitrite, chloride,  
14 and fluoride ions. As I mentioned before, we have a  
15 number of processes alone or in combination that may be  
16 feasible that we are evaluating, which includes  
17 membrane for: Filtration and micro-filtration, reverse  
18 osmosis, ion exchange, a combination of evaporation and  
19 crystallization, and a partial treatment of the  
20 effluent.

21 The initial treatability studies are  
22 being conducted using a numerical simulation and the  
23 pilot testing will involve a physical simulation away  
24 from the Snap Lake mine site. To do this, a reduced  
25 scale treatment plant will be used to evaluate the

1 effectiveness of the treatment and the various processes  
2 to obtain critical design parameters for a full-scale  
3 system, and predict the system's performance.

4 Slide 8. This is what it looks like  
5 inside a -- a pilot testing facility. We have  
6 opportunities for clarifier gravity settling, micro-  
7 filtration, reverse osmosis, and ion exchange chemical  
8 softening.

9 Slide 9 just describes the var -- again,  
10 the various processes that -- that we would evaluate,  
11 micro-filtration. You'll see the acronyms that are  
12 used there in the slides that follow. So micro-  
13 filtration "MF"; reverse osmosis "RO"; ion exchange  
14 "IX"; and evaporation crystallization. In the end, we  
15 either end up with a concentrated brine or con -- or  
16 solid salts, or a combination of both.

17 There are four (4) pilot test options  
18 being considered. They're outlined in the next four  
19 (4) slides. I don't think I'll -- I'll go through  
20 these in detail except to mention again that micro-  
21 filtration -- "MF" stands for micro-filtration; "RO"  
22 stands for reverse osmosis. The little blue things  
23 there are -- are pumps, so they represent how we would  
24 take a portion of the mine water, a percentage of which  
25 we -- we don't know, that's part of -- part of the

1 concept study, and then run it through various  
2 combinations of processes to blend it back with the  
3 final effluent discharge.

4 Slide 11 again shows a different  
5 combination of processes. Slide 12 and Slide 13.  
6 Julie L'Heureux can walk you through those if we have  
7 questions about how -- how those various processes  
8 might conceptually work.

9 On Slide 14 I want to walk you through a  
10 very, very generic timeline of -- of kind of the steps  
11 that we need to take to evaluate and potentially  
12 implement -- implement any kind of treatment which is,  
13 again, currently in a conceptual pilot testing phase.

14 So, as I mentioned, we've completed the  
15 pre-feasibility work, we are now beginning the pilot  
16 concept testing, we're at the early stages. We will  
17 evaluate the results of that pilot concept testing to  
18 determine if it's feasible and whether we would proceed  
19 with a design on that basis. We'd then proceed to a  
20 detailed design, approvals, and finally implementation  
21 sometime in 2015.

22 Over the life of the mine to -- to  
23 improve our water management, we will continue to  
24 improve our understanding of structural influences on  
25 the hydro -- hydro-geological model as has been

1 presented by Itasca.

2                   We will improve our understanding of  
3 underwater flow rates, the variability and any  
4 influencing factors, and we also need to improve our  
5 water management capacity. As you've seen in the --  
6 the various graphs that have been presented, we  
7 currently are discharging approximately 43,000 cubic  
8 metres a day. We will need to manage in the future up  
9 to 60,000 metres cube per day.

10                   That involves improving our pumping  
11 system reliability and infrastructure in support of the  
12 life-of-mine plan. And -- and specifically that  
13 includes -- inclu -- increasing capacity for dewatering  
14 of the underground mine workings; increasing capacity  
15 of the water treatment plant; and increasing our  
16 capacity to discharge effluent.

17                   Phase III at some point in the future  
18 will be -- will involve completing the life-of-mine  
19 dewatering design and implantation based on the  
20 evaluation of the Phase II.

21                   Currently we're commissioning a modular  
22 water treatment plant to add 25,000 cubic metres of  
23 treatment capacity, which includes 10,000 metres -- up  
24 to 10,000 cubic metres a day of dirty water and up to  
25 15,000 cubic metres a day of clear water.



1 Slide 16 is a schematic of our current  
2 water management system. Again, you'll see the  
3 differentiation between our -- our dirty water which is  
4 our -- a majority of our -- our underwater management  
5 is dirty water, and our upper dewatering system which  
6 is clear water.

7 All that flows through our water  
8 treatment plant before being discharged to Snap Lake.  
9 You'll see our two (2) compliance points there, SNP 02-  
10 17B which is at the discharge of the water treatment  
11 plant; final point before entering the lake. And SNP  
12 02-01 which is where we measure flows and water quality  
13 from underground.

14 I'm going to hand it over to Dr. Peter  
15 Chapman now who will speak to the part of the TDS  
16 Response Plan where we're required to talk about site-  
17 specific water quality objectives and EQCs.

18

19 (BRIEF PAUSE)

20

21 DR. PETER CHAPMAN: Peter Chapman here.  
22 Thanks, Erica. So what I'm going to do is I'm going to  
23 go through fluoride, chloride, and then TDS in order  
24 spending more time on TDS because it's the one of most  
25 interest.

1 (BRIEF PAUSE)

2

3 DR. PETER CHAPMAN: We're having a  
4 technical difficulty here in terms of changing...

5

6 (BRIEF PAUSE)

7

8 DR. PETER CHAPMAN: Okay, we're now to  
9 slide 2, one of my favourite -- actually, slide 18,  
10 sorry, second in my presentation, that shows a lovely  
11 picture I love, but there's the goal; basically, we  
12 want to protect the fish stocks. In protecting the  
13 fish stocks we want to protect what they eat, the  
14 habitat they have, and in doing so we're protecting the  
15 function of the lake.

16 Fluoride. Okay. What we did with  
17 fluoride -- and Erica said earlier, and I quite agree  
18 with her, that this is an interesting situation. It's,  
19 if you like, a unique situation. TDS, total dissolved  
20 concentrations, haven't changed for several years; the  
21 composition hasn't changed.

22 And realistically, there's no reason  
23 that we couldn't set EQCs solely based on TDS rather  
24 than on the individual components, because setting it  
25 based on the whole of TDS would protect against the

1 individual components as they interact within that.

2                   However, because there was a requirement  
3 to develop individual site-specific water quality  
4 objectives we've done so. For fluoride what we did is  
5 we followed the Canadian Council of Ministers of the  
6 Environment, the 2007 document. And for those of you  
7 not familiar with that document, what that document  
8 does is set out in Canada how you develop water quality  
9 guidelines for Canada and also how you develop regional  
10 or site-specific benchmarks or objectives.

11                   So what we did is developed a species  
12 sensitivity distribution and if you look at the graph  
13 here on Slide 19, you can see percent of species  
14 affected going up from zero to a hundred percent.  
15 Fluoride concentration across the bottom and you simply  
16 graph on that all the data you have.

17                   Now what we did is we looked at two (2)  
18 previous benchmarks or guidelines if you like: BC  
19 Ministry of Environment 1995. They have a benchmark  
20 that's actually based on hardness, it's quite  
21 interesting, but based on only one (1) value. CCME,  
22 Canadian Council of Ministers of the Environment, has a  
23 value from 2002 but as you can see it's now 2014.  
24 There's been a lot of work done since then.

25                   So what we did is we followed the

1 Canadian Council of Ministers of the Environment 2007,  
2 developed a species sensitivity distribution and  
3 developed what's called an HC5; a 5 percent level,  
4 which is the level at which the 95 percent of the  
5 species will be protected and per Canadian Council of  
6 Ministers of the Environment that's where you can set a  
7 guideline or objective. So we set Guideline 2.46.

8                   If you're wondering what's down here,  
9 that's a 2.25, that's fingernail clams that, in fact,  
10 are doing very well in Snap Lake. They've actually  
11 increased in abundance in the last AMP.

12                   Chloride. In the case of chloride  
13 Ekati, as you -- most of you are aware, has developed a  
14 -- a chloride site-specific water quality objective.  
15 But, in fact, this was developed not just for Ekati, it  
16 was based on a publication Elphick et al in 2011 in the  
17 peer reviewed international journal Environmental  
18 Toxicology and Chemistry, that talked about chloride  
19 and the hardness effects more generally than just in  
20 Ekati. So base -- and so that's been accepted by the  
21 Wek'eezhii Land and Water Board as part of the Ekati  
22 renewed water licence. And because it's published in  
23 the primary literature it's also applicable.

24                   We used the site-specific water quality  
25 objective from Ekati at a hardness of one sixty (160)

1 and we got a value of 388 milligrams per litre  
2 chloride. So that's what we're proposing as the  
3 individual site-specific water quality objective for  
4 chloride.

5 Now, I'll move on to TDS. And I'm going  
6 to spend a fair bit more time on that because it's  
7 important. And you've seen a lot of these slides, some  
8 of you before, because we've gone through a whole  
9 process starting before the last water licence where we  
10 talked about TDS and how we were going to do testing.  
11 And it's taken us a few years to do the testing,  
12 because we have tested a large range of organisms and  
13 we wanted to do it technically defensible.

14 And it's interesting, because as I said,  
15 this is a unique situation. You can read up here how  
16 the Snap Lake TDS composition has been pretty stable.  
17 Look at that, chloride 45/46 percent, calcium 20/21  
18 percent, and I apologize, this is slide 21 for those on  
19 the phone. You can read that and you can also see it  
20 in slide 22 in this figure, and you can see here from  
21 about 2005 onwards, very, very constant. So all the  
22 same.

23 This is very different than Ekati, where  
24 Ekati the chloride is decreasing. So they couldn't do  
25 a site-specific water quality objective on TDS because

1 it was changing. We can. And every indication we have  
2 indicates that the TDS composition should not change  
3 over time. It should stay the same.

4 Now, in terms of protecting, again, most  
5 of you have seen this. Just -- just to emphasize,  
6 slide 23, what we want to protect is not just fish, but  
7 the aquatic food web on which they depend. So what  
8 that meant was we had to test the plankton, the  
9 phytoplankton, the small animals that live in the lake.  
10 The zooplankton, the small animals that live in the  
11 lake. The benthic invertebrates, the animals -- the  
12 small animals that live in the mud, and fish. So we're  
13 protecting the food chain, as well as protecting the  
14 fish.

15 And we had three (3) purposes right  
16 here, first of all, indirect effects from the plankton.  
17 Okay. So if the fish are eating the small animals in  
18 the water that depend on the small plants, are those  
19 going to be okay?

20 Secondly, for indirect effects, if  
21 they're eating the critters that live on the bottom,  
22 are those critters okay?

23 And finally, direct effects on the fish.  
24 And many of you may remember there were a lot of  
25 discussions at technical sessions and at the last water

1 licence hearing about what was the best thing to test  
2 for fish.

3                   And there was general agreement that the  
4 most sensitive life stage of fish is the egg stage from  
5 fertilization onwards. So that's exactly what we  
6 tested. And I'll get to that shortly.

7                   In terms of the lower food chain  
8 organisms, phytoplankton, we looked at growth  
9 inhibition, zooplankton, survival growth. You can read  
10 those here. The 'a', little 'a' that you can see  
11 against the midge, which is a little insect larvae,  
12 chironomids against the rotifer, here against the water  
13 flea, against the diatom, means the genus is found in  
14 Snap Lake.

15                   And when you're doing a toxicity test in  
16 a laboratory, yes, we like to use laboratory white rats  
17 and certainly ceriodaphnia is a laboratory white rat as  
18 is daphnia. But daphnia is found in the lake. So you  
19 have more relevance if you're testing the organisms  
20 that are more similar to what's -- or they are the  
21 organisms that are found in the lake. And you can see  
22 a pretty picture of the organisms here.

23                   In terms of the fish work, I've got at  
24 the bottom, this is slide 26, "See the poster."  
25 There's a poster on the wall and I apologize for those

1 of you on the phone you can't see the poster. But the  
2 poster simply summarizes what's in our detailed  
3 presentation. Most of you will have seen this. This  
4 was presented in January at the fisheries conference.  
5 It was also presented previously at the aquatic  
6 toxicity workshop in October. And we hope ultimately  
7 to publish on this. We just need to find time to write  
8 it up.

9                   Anyway, so basically as you can see up  
10 here the egg hardening stage is generally the most  
11 sensitive. Okay. And we looked at lake trout and  
12 arctic grayling, which is certainly important and found  
13 there. And we went from the fertilized egg right  
14 through to the early fry life stages.

15                   Two (2) different exposures, one (1)  
16 prior to fertilization and one (1) after fertilization.  
17 We call them wet -- dry and wet. And dry is simply the  
18 fact that we fertilized them before we put them into  
19 the solution and wet is the fertilization occurred when  
20 they were in the test solutions.

21                   And here's a picture. I couldn't resist  
22 this because unless you do toxicity testing you can't  
23 imagine how nervous one gets waiting to see what's  
24 going to happen, particularly for some of these tests  
25 that go on for months. And we were very happy, this is



1 slide 27, to see some very nice grayling there that  
2 looked perfect and were doing very well, even at the  
3 highest test concentration.

4                   Okay. I'm now going to have to hit you  
5 with data. I apologize. I'll take some time going  
6 through it. But what we've got here, this is slide 28,  
7 is a table. It shows test species, the endpoint and  
8 the concentration of TDS. And going down we go from  
9 water flea right through to trout and grayling.

10                   The endpoint, IC, means inhibition  
11 concentration. In other words, it's the concentration  
12 at which we see an effect. Now, you'll see in some  
13 cases we have a ten (10); in some cases a twenty (20),  
14 ten (10), ten (10), twenty (20), ten (10), and so on.  
15 Ideally what you want to do is get to a 10 percent  
16 effect because that's low enough that it really is at  
17 the point that you're not going to see any effects on  
18 the individual. So -- and it's so low it's right at  
19 background.

20                   The problem you get in toxicity tests  
21 and in real life is there's a lot of natural  
22 variability. And in some cases we couldn't get an IC  
23 10, we could only do an IC 20 because of -- there  
24 wasn't that much difference between the controls.  
25 Because you will see some effects in the controls

1 compared to that.

2 Is an IC 20 valid? Yes. If you go back  
3 to Canadian Council of Ministers of the Environment,  
4 they prefer a 10 percent level, but they certainly  
5 accept a 20 percent level. If you look at the USEPA  
6 water quality criteria, the last two (2) criteria they  
7 developed for ammonia and for selenium used a 20  
8 percent effect level. So that's very reasonable.

9 Okay. Looking down, now let's go over  
10 to the TDS column. And notice, first of all, there's  
11 an awful lot of 'greater than'. And if you're  
12 wondering why the numbers are so different, greater  
13 than thirteen-seventy-nine (1,379), greater than the  
14 fourteen-seventy-four (1,474), the reason for that is  
15 that when we did the testing we tested -- we tried to  
16 test up to fifteen (15)...

17

18 (BRIEF PAUSE)

19

20 DR. PETER CHAPMAN: Whoops, sorry. I  
21 got carried away and turned myself off. But we -- we  
22 test nominals to start with. So what we do is we  
23 estimate that we've got up to fifteen hundred (1,500).  
24 But that's not good enough. Then we send it to the lab  
25 who measures it and determines what we actually have.

1 And that's why you'll see in some cases we've got  
2 thirteen-seventy-nine (1,379), fourteen-seventy-four  
3 (1,474), fourteen-eighty-seven (1,487), and so on. We  
4 came pretty close, but you know, in measuring out  
5 you're not going to get it quite right. But it's not  
6 too bad. Not too bad.

7                   It's interesting here when you come to  
8 fish you'll see everything's fourteen-ninety (1,490),  
9 fourteen-eighty-four (1,484), fourteen-nineteen  
10 (1,419), fourteen-fourteen (1,414). There's one (1)  
11 with the dry fertilization fry survival nine-ninety-one  
12 (991). A little lower, that's interesting. But you do  
13 get variability and, in some ways, you can look at  
14 these as replicas, even though in this case dry  
15 fertilization -- fertilization occurred unnaturally.  
16 Because normally you get fertilization occurring in  
17 water. We did it outside water in that case.

18                   The key ones here, down here, are the  
19 daphnia magna and the ceriodaphnia. So ceriodaphnia,  
20 the 10 percent is -- level is five-sixty (560), 20  
21 percent seven-seven-eight (778), daphnia six-eighty-  
22 four (684).

23                   Now, you look at these and you say, How  
24 are we going to work this out? Because ideally what we  
25 want to do is follow Canadian Council of Ministers of

1 the Environment 2007 and do a species sensitivity  
2 distribution.

3 The problem we face is we have all these  
4 'greater than' numbers. And with 'greater than'  
5 numbers you don't know what they are. You can't put  
6 them in. So CCME allows a different way of doing it  
7 which goes back to Canadian Council of Ministers of the  
8 Environment 2003. This is slide 29.

9 Basically you can go back to the old way  
10 where you take the lowest value and basically apply an  
11 application factor to it, or an uncertainty factor if  
12 you want to call it that. So, again, the SSDs weren't  
13 useful. We only had the three (3) unfounded values,  
14 the two (2) daphnid, and the nine-ninety-one (991) for  
15 the trout.

16 Now, ceriodaphnia found in Snap Lake,  
17 the IC 20, seven-seventy-eight (778). Daphnia found in  
18 Snap Lake, the IC 20, six-eighty-four (684). And we  
19 spent a -- an awful long time looking at this and  
20 trying to figure it out. And it seemed to us the most  
21 reasonable, particularly in the context that 500  
22 milligrams per litre TDS is the default value below  
23 which, if you haven't done site specific, people say  
24 things are probably okay.

25 Take, for example, Diavik. Diavik, as

1 you may recall, has a -- a benchmark of five hundred  
2 (500) given by the Wek'eezhii Land and Water Board  
3 without any site-specific testing. Okay. So we're at  
4 six-eighty-four (684)? Daphnia make up about 2 percent  
5 of the zooplankton in Snap lake.

6 Copepods weren't tested, unfortunately.  
7 We would have liked to have test copepods. We tried.  
8 The problem we ran into is that there's no really way -  
9 - nobody's developed a good way to test them, so we'd  
10 have to develop a new way to test them in freshwater.

11 And I'm sorry, I should have mentioned  
12 that all the tests we did were based where they were  
13 available and Environment Canada accept the test  
14 protocols. Otherwise, where they weren't available, on  
15 test protocols that were out there in the literature.  
16 And that's all in our information.

17 We used an uncertainty factor of one (1)  
18 to get a site-specific water quality objective six-  
19 eighty-four (684). And that'd be the same as the TDS  
20 EQC because of the mixing of treated mine water. And  
21 we'll talk about the EQC more tomorrow.

22 Let me just go a little bit further, how  
23 we're doing with daphnia. This here is cladocerans.  
24 This is unnumbered slide. This is after slide 29, so  
25 it should be slide 30. I'm going to blame Gil -- Bill

1 Gates for no number, but that's another story. But if  
2 you look at these two (2) slides, this is the  
3 cladoceran, or if you like, daphnid biomass.

4                   And then the daphnid abundance. And the  
5 year's on the bottom, you can see, and then the normal  
6 range is the dashed lines. See it went down? Now,  
7 it's coming up again. They went down. Now, they're  
8 coming up again. So daphnia don't seem to be -- if  
9 they were reacting to TDS increasing, you'd expect them  
10 to go down, but they've actually just varied. So they  
11 seem to be doing okay so far.

12                   What about zooplankton in general? You  
13 know, basically, right through until 2013, mainly  
14 copepods. Okay. Or rotifers, which we did test. In  
15 the baseline, 74 percent calanoid copepods, 18 percent.  
16 So main -- seventy-four (74) plus eighteen (18) mainly  
17 copepods, small amount rotifers and cladocerans. And  
18 then it shifted. We've got changes. We're up to 39  
19 percent cyclopoid, copepods, calanoid, rotifers, up to  
20 29 percent. Cladocerans less than 1 to 7 percent, so  
21 very small proportion of the population.

22                   Now, I'm going to have to do something  
23 now I never thought I was going to have to do. But I'm  
24 going to do it. I'm going to take a breath and I'm  
25 going to read it into the record. Todd Slack, you were

1 right. God, that was hard. Okay.

2                   Anyway, basically January 6th -- and  
3 I'll explain why he was right -- January 6th we had an  
4 information session. This was right after the  
5 fisheries conference. And we had a -- a lot of people  
6 there and we presented what we had going up six-eighty-  
7 four (684). And we presented that table I showed you  
8 that showed where everything was.

9                   And Todd and others, but in particular  
10 Todd, asked a very good question. Okay. What about  
11 reproducibility? You know, how reproducible are they?  
12 And, you know, I've -- I believe my recollection is  
13 that I said, Well, you know, they should be pretty  
14 reproducible. There'll be some variation. Could they  
15 be lower? Could be. Could they be higher? They could  
16 be higher. And I pointed out that those greater than  
17 fourteen hundred (1,400) and that sort of thing, you  
18 really wouldn't expect that big a -- a deal because --  
19 but you see -- you might see some differences at the  
20 lower end.

21                   And so basically and as a result of  
22 discussion -- and I can't take credit for it because it  
23 was De Beers that suggested to me, Why don't we repeat  
24 the test and see what we get? So I said, Fine,  
25 expecting not to see much of anything. And I was

1 surprised. Science is always full of surprises.

2                   Basically, it's interesting because test  
3 2, as you can see here on the graph, this is slide 33  
4 for those of you on the phone. Test 2 is in red. Test  
5 1, the first one (1) six-eighty-four (684) is in blue.  
6 Look at the dose response. Very, very similar dose  
7 response, but in fact it's very flat. And because it's  
8 so flat we actually ended up with two (2) different  
9 values. We got fourteen-seventy-seven (1,477) for the  
10 second test, compared to the first test which was six-  
11 eighty-four (684).

12                   Now, if you take the geometric mean of  
13 these two (2) studies you get 1,005 milligrams per  
14 litre. Now, why take the geometric mean? The reason  
15 you take the geometric mean is because if you go back  
16 to the Canadian Council of Ministers of the Environment  
17 2007, when you develop the species sensitivity  
18 distributions, you go back to the literature. You go  
19 through the literature, you sort out which studies are  
20 applicable. And in many cases, particularly for  
21 daphnias which are often tested, you'll find more than  
22 one (1) study.

23                   So the advice from CCME, and you can see  
24 the two (2) quotes, the first two (2) dots there is, is  
25 basically take the geometric mean. Now, this was also



1 done for Ekati when they were developing their site  
2 specific-water quality objectives. And for two (2) of  
3 those site-specific water quality objectives, they  
4 actually did exactly that for daphnia.

5                   So, again, this was done. There's  
6 precedent. There's VCME -- VCC -- sorry, Canadian  
7 Council of Ministers of the Environment 2007, and  
8 precedent suggests that we should take the geometric  
9 mean. Now, if we were to take the geometric mean then  
10 we'd replace the six-eighty-four (684) with a thousand  
11 five (1,005).

12                   Now, does that seem high? Well, you  
13 know, go back to Alaska. And I -- you'll see in the  
14 slide before, while although in different format,  
15 Alaska basically says slides 35, the TDS can't exceed a  
16 thousand, although there have been cases where they've  
17 given higher numbers and so on. So it's not out of  
18 scale if you put it -- this is slide 36. If I repeat  
19 this table that shows test species endpoint TDS, put a  
20 thousand five (1,005) here. It kind of fits a little  
21 more with all of these numbers than it did before.

22                   Now, I'm not saying at this point that  
23 we should drop the six-eighty-four (684) and go to a  
24 thousand five (1,005). What I'm saying, and De Beers  
25 has agreed with this, that I think we need to look at

1 this a little further. I think we need to follow-up on  
2 this and not just one (1) test. We need to do at least  
3 one (1) more daphnia test. Okay. To really figure  
4 out, because that's the lynchpin what the  
5 reproducibility is and what the geometric mean  
6 reasonably could be to protect that population.

7                   And I think we need to go back to  
8 testing with copepods. We do have one (1) study in the  
9 literature that suggests copepods are relatively  
10 insensitive. But we'd really like to test with  
11 copepods. It's not going to be easy because we have to  
12 develop a test for that. But copepods to determine if  
13 that is correct.

14                   And then, you know, if once we've done  
15 that provide a final recommended TDS site-specific  
16 water quality objective. And, you know, this isn't  
17 science. This is something that, you know, we talked  
18 about, you know, in terms of process. Maybe a phased  
19 review of, you know, starting out with six-eighty-four  
20 (684) and then seeing what we get from this.

21                   If nothing else, this additional testing  
22 with daphnia certainly indicates very strongly that the  
23 six-eighty-four (684) is protective. It indicates it  
24 may be over protective, but it certainly does suggest  
25 it's very protective. And that's the end of my

1 presentation. Thank you.

2

3 (BRIEF PAUSE)

4

5 DR. KATHY RACHER: Kathy Racher for the  
6 Board. What time have we got here? I think we should  
7 just start with some questions now and we'll take a  
8 break later. Sean's always ready for a question. Go  
9 for it.

10

11 QUESTION PERIOD:

12 MR. SEAN WHITAKER: Sean Whitaker,  
13 Environment and Natural Resources. Dr. Chapman, thank  
14 you for that presentation. As always, it's a pleasure.

15 I'm actually going to go into a few of  
16 the references that you had suggested, specifically the  
17 other jurisdictions and their applic -- applicable TDS  
18 standards, specifically the Alaska one (1) I'm going to  
19 start with.

20 You pointed out to the tech Red Dog Mine  
21 which is a coastal mine. It's only about four (4) or  
22 500 kilometres off of the ocean. So they provided a  
23 thousand milligrams per litre as their TDS number.  
24 However, Alaska is also under that same guideline, been  
25 restrictive to another mine called Gold Creek Mine

1 which is 300 parts per million in that same document.

2 And they've always restricted chlorides to 200 parts  
3 per million in several of the mines in Alaska.

4 And I'm just wondering, did you account  
5 for that and why Alaska chooses to use those numbers?

6 DR. PETER CHAPMAN: Peter Chapman here.  
7 Basically we didn't go into every permit that was  
8 allowed in Alaska. My understanding of the permits,  
9 and it's a generic understanding not a specific because  
10 as I said I haven't got into it in detail, is that they  
11 look at the specific circumstances.

12 In some cases they did testing. For  
13 instance, the Kenston (phonetic) Gold Mine, we actually  
14 did the testing and that was probably in the  
15 literature. In other cases they simply look at what  
16 can be achieved by the mine and what may be coming out.  
17 Very similar to what happened with Snap Lake with the  
18 three-fifty (350). So it varies. But I can't speak  
19 about every last one (1) of them.

20 MR. SEAN WHITAKER: Sean Whitaker,  
21 Environment and Natural Resources.

22 I think I know where they got the two  
23 hundred (200) number for chloride. It's actually in,  
24 as of December 1st, 1999, in the USEPA's chronic  
25 toxicity value. They have a maximum acute criteria of

1 230 parts per million is where that number probably  
2 comes from.

3 DR. PETER CHAPMAN: Yeah. Peter  
4 Chapman. I'd agree with you. I was talking about TDS  
5 and it certainly likely comes from there. But then  
6 again, look at the work on chloride that's being done  
7 and published by Elphick et al with hardness. Science  
8 does advance, and we are moving forward.

9 MR. SEAN WHITAKER: Sean Whitaker,  
10 Environment and Natural Resources.

11 I'll actually refer you -- they actually  
12 used your numbers, the Alaska -- University of Alaska.  
13 They quoted Dr. Chapman, and they found that changes in  
14 the ionic composition will increase the toxicity, which  
15 is probably why we saw that original change after the  
16 original ionic composition change. We got more  
17 chlorides because you're having more -- 48 percent of  
18 your effluent is chloride; that's why we probably saw  
19 that initial change in 2005/2006.

20 However, in this report they then go to  
21 say that the LC 50, the lethal concentration 50 for  
22 ceriodaphnia dubia, daphnia magna, and fathead minnows  
23 is less than 1,000 parts per million. And I -- I'm  
24 going to provide all of this to the Board, all the  
25 primary references that I'm quoting today. But did you

1 -- it wasn't on your list of chosen numbers, and they  
2 did use your study when they compared it to theirs.

3 And I'm just wondering why did you  
4 exclude some, especially if they did quote you in your  
5 -- in their studies?

6 DR. PETER CHAPMAN: Yeah. Peter  
7 Chapman here. Just so to -- we're sure we're talking  
8 about the same thing, can I take a look at that and  
9 answer you after the break after I've made sure what  
10 you're looking at? Because I have been cited a couple  
11 of times. I just want to make sure it's the right  
12 study.

13 MR. SEAN WHITAKER: Sean Whitaker,  
14 Environment and Natural Resources. I can -- I'm going  
15 to -- I'm going to provide it to the Board, even if  
16 it's -- we can take it as an Information Request and  
17 you can provide a written response after.

18 DR. PETER CHAPMAN: And, you know,  
19 yeah. No. Peter Chapman here. And, you know, again  
20 just to emphasize without seeing it. You know, what  
21 we're doing here is site specific, so I'll -- I'll take  
22 a look at that. But we are talking site specific based  
23 on an awful lot of testing here.

24 DR. KATHY RACHER: Kathy Racher for the  
25 Board. I think it would be good if -- if you could

1 provide those references to -- to the Board and to  
2 Peter. I'm going to write that down as an Information  
3 Request for you to respond to his question because  
4 obviously you can't respond until you've seen it.

5                   The data, if you can do that by tomorrow  
6 then -- then you can talk about it tomorrow. Other --  
7 otherwise -- otherwise by April 30th in writing would  
8 be fine. But I'll -- I'll write it down as an  
9 Information Request so we don't forget, if that's all  
10 right.

11                   DR. PETER CHAPMAN: Peter Chapman.  
12 That's -- that's good. Just can you give us the  
13 wording? And I believe that's IR-6, correct?

14

15                   (BRIEF PAUSE)

16

17                   DR. PETER CHAPMAN: I apologize. Peter  
18 Chapman. IR-7. You're right. We're all getting  
19 confused.

20

21 --- INFORMATION REQUEST NO. 7: Why did Dr. Chapman  
22   exclude some  
23   jurisdictions

24

25                   MR. SEAN WHITAKER: Sean Whitaker,

1 Environment and Natural Resources. I'm going to go to  
2 some other jurisdictions in the United States that do  
3 have TDS limits for brine connate water.

4 Pennsylvania has a TDS number of five  
5 hundred (500), and it's actually based on Dunkirk Creek  
6 (phonetic). Well, it's a different operation. It was  
7 from hydraulic fracturing. It was brine water that was  
8 shown to be causing the impacts. And Pennsylvania now  
9 has a 500 parts per million limit for TDS for all  
10 discharges in the state.

11 Oh, US Ohio (phonetic). EPA is also  
12 inclu -- considering that. Just because we're using  
13 outside jurisdictions I just wanted to bring up that  
14 there are other jurisdictions in the United States that  
15 do have TDS numbers, and then also put a very explicit  
16 chloride number that isn't three-eighty-eight (388) in  
17 that licence -- in the licences.

18 DR. KATHY RACHER: Kathy Racher for the  
19 Board. I'm just going to step in here. Sorry, Peter.  
20 I guess -- I mean, it's kind of hard for -- for the  
21 Company to respond to those without having reviewed  
22 that.

23 So it would be helpful in your technical  
24 report to include those references and discuss how  
25 they're relevant versus the information that was



1 provided by the Company. And then the Company can  
2 respond after that.

3 I took that first IR just because you --  
4 you know, it was just a specific quote of Peter. And I  
5 thought he -- he should be able to -- to talk about  
6 that one (1) in particular. But, in general, that  
7 should be part of your technical report to the Board.

8 MR. SEAN WHITAKER: Sean Whitaker,  
9 Environment and Natural Resources. It will be in the  
10 technical report. I just wanted to highlight that  
11 there are other jurisdictions that weren't included in  
12 the analysis.

13 DR. PETER CHAPMAN: Yeah. Peter  
14 Chapman. There's certainly range out there. And the  
15 issue, of course, often is that, you know, people just  
16 don't do the level of testing that's being done here.  
17 And TDS concentrations, you can't set a universal TDS  
18 concentration because it depends on the composition.  
19 So we're talking different compositions. We're talking  
20 apples and oranges.

21

22 (BRIEF PAUSE)

23

24 DR. KATHY RACHER: Kathy Racher for the  
25 Board. Do we have some more questions in the room?

1 Sean, you want to continue?

2 MR. SEAN WHITAKER: Sean Whitaker,  
3 Environment and Natural Resources. I'll let other  
4 people just ask some questions if they're on the line.  
5 I just want to confer with my colleagues.

6 DR. KATHY RACHER: Kathy Racher. Todd,  
7 go ahead.

8 MR. TODD SLACK: Yeah, just a point of  
9 clarification. On the bottom of slide 3, De Beers  
10 asked for the opportunity to present additional  
11 evidence specific to TDS as part of the Land and Water  
12 Board review process.

13 Can we get some more information,  
14 particularly as to when you could see this being  
15 submitted in terms of what -- to ensure that there's  
16 appropriate time for review? For instance, we just got  
17 the supplemental submission on Friday after 5:00. So  
18 I'm just looking for some clarity.

19

20 (BRIEF PAUSE)

21

22 MS. ERICA BONHOMME: Erica Bonhomme.  
23 So we -- we think we need about a couple of months to  
24 provide good substantial additional information that  
25 may support a higher site-specific water quality

1 objective. We not -- we're not saying that it will  
2 necessarily. Because this is part of the TDS Response  
3 Plan we would expect that it -- to be included as part  
4 of the Land and Water Board's review process of the TDS  
5 Response Plan, and the associated parameters. I can't  
6 speak for the Board on that.

7 But we would ha -- we would -- we would  
8 need a couple of months to -- two (2) months from now  
9 to -- to have the opportunity to evaluate whether  
10 additional information supports a different site-  
11 specific water qu -- water quality objective, including  
12 potentially a different EQC.

13 MR. TODD SLACK: Todd Slack with the  
14 Yellowknives. Forgive me for being slow. Sorry. Come  
15 again?

16 We're going to look at six-eighty-four  
17 (684) in this EA process, but then you're suggesting  
18 that we aren't actually considering the six-eighty-four  
19 (684) and we might be considering something --  
20 something entirely different that would be done through  
21 the Land and Water Board process.

22 Do I get that?

23 MS. ERICA BONHOMME: Erica Bonhomme. I  
24 -- I cannot -- absolutely not speak for the Board in  
25 terms of how our information's reviewed. I -- I'm just

1 saying we do have additional information now. It's  
2 been provided on Friday. We may have additional  
3 information that will, you know, support a higher site-  
4 specific water quality objective. We would like it  
5 considered. How that is considered in this process I -  
6 - I don't know.

7

8 (BRIEF PAUSE)

9

10 MR. TODD SLACK: Todd Slack with the  
11 Yellowknives.

12 The bottom on page 5 you suggest that  
13 not -- that meeting the 350 milligram per litre limit  
14 is not economically feasible. During environmental  
15 assessments generally there's an alternatives  
16 assessment in terms of what can be done and why.

17 I'm wondering if De Beers is able to  
18 present evidence that suggests as to why they've  
19 considered to not be economically feasible?

20

21 (BRIEF PAUSE)

22

23 MS. ERICA BONHOMME: Erica Bonhomme.  
24 So in our TDS Response Plan we did give information  
25 about the pre -- the pre-feasibility evaluation of

1 various options for treating effluent. One (1) of them  
2 included an evaluation of treating full mine effluent.  
3 The cost that was provided was a 188 million. We think  
4 that's an unfeasible alternative for treating effluent  
5 down to our -- our current value which would maint -- a  
6 value which would maintain a water quality within Snap  
7 Lake of 350 milligrams per litre TDS.

8 More recently the Mining Association of  
9 Canada has done an evaluation of treatment  
10 technologies. And that -- that is a -- a -- the pre --  
11 preliminary report has just been released on that. And  
12 their conclusion is also that full effluent treatment  
13 is -- is unfeasible. And I'm -- I'm -- I apologize.  
14 Mining Association Canada participated in that so it  
15 was actually in an Environment Canada report that --  
16 that was commissioned by Environment Canada.

17

18 (BRIEF PAUSE)

19

20 MR. TODD SLACK: Todd Slack with the  
21 Yellowknives. If, at the break, can -- I could ask you  
22 to provide the -- the pointer as to where that's found  
23 in the submission? I don't happen to see it, or recall  
24 seeing it. And then one (1) other question wi --  
25 regarding that.

1                   Is this the 2008 Snap Lake Water  
2 Management Alternatives Report that Golder did? Is  
3 that the one that you're referencing?

4                   MS. ERICA BONHOMME: No, the -- the  
5 informa -- the information we've presented is  
6 summarized in the TDS Response Plan. I think we'd have  
7 to ask Environment Canada whether they're -- they are  
8 willing to release that report publicly. Certainly,  
9 the people are -- are -- who have been involved in the  
10 study have made it -- have -- it's been available to  
11 them. So if -- if you wouldn't mind, I'd have to ask  
12 them.

13                  MR. TODD SLACK: Todd Slack with the  
14 Yellowknives. Yeah, sure. More information is always  
15 great, but what -- the one (1) I was referring to was  
16 the alternatives assessment where you came up with the  
17 \$180 million per year. That, as a starting point, to  
18 establish the rationale as to why De Beers thinks that  
19 they can't go that way. I -- that would be interesting  
20 to see.

21

22                                   (BRIEF PAUSE)

23

24                   MS. ERICA BONHOMME: Erica Bonhomme.  
25 Sorry for -- we -- I think we -- we'd be prepared to

1 provide it if you give us an opportunity to go through  
2 it, make sure there's no proprietary information in  
3 that report. Or we can -- we can black line some of  
4 those pieces as required.

5 MR. TODD SLACK: Todd Slack with the  
6 Yellowknives. That'd be terrific.

7 Now, just to be clear, that is not the -  
8 - the Golder report, the Snap Lake Water Management  
9 Alternatives Report, correct?

10 MS. ERICA BONHOMME: That report is --  
11 has previously been provided. It's a bit outdated.  
12 This is a report done for us by CMH2 (sic) Hill.

13 MR. TODD SLACK: I guess the question  
14 that I have then is, if Golder was doing this back in  
15 2008, which is six (6) years ago, and we knew the TDS  
16 issue was coming down the road, why are we only now  
17 just getting to this -- this consideration? I know  
18 that the work from Golder has been underway, but even  
19 that seems like a relatively recent initiative.

20 Why so late in the day, I guess is the  
21 question?

22 MS. ERICA BONHOMME: The -- the first  
23 time we've really looked -- Eri -- Erica Bonhomme. The  
24 first time we -- we really started looking at some of  
25 these long-term predictions is after, you know, 2011

1 when we started getting more detailed information about  
2 our structures, as we've looked at in the under --  
3 underground model. So, really, some of this pre-  
4 feasibility work wasn't initiated in earnest based on  
5 current and accurate information until 2012.

6 So I would say we haven't been waiting  
7 on anything. We've -- we've simply been, you know,  
8 looking at improving our understanding of the mine  
9 geological conditions of our mine plan and the long-  
10 term implications of -- of what that will do and where  
11 -- where we need to pay attention.

12 MR. TODD SLACK: And my -- my last  
13 question here, if the -- if that 2008 Golder report,  
14 the Water Management Alternatives, if that's already on  
15 the registry, would you guys be able to provide a link  
16 to it, or a registry? Pardon me.

17

18 (BRIEF PAUSE)

19

20 MS. ERICA BONHOMME: Yeah. Erica  
21 Bonhomme. I -- I believe that was submitted as a  
22 previous -- in the -- under the previous water licence  
23 amendment. So, yeah, we can certainly do that.

24 MR. TODD SLACK: Thanks very much.  
25 That's it for me on this one.



1 (BRIEF PAUSE)

2

3 MR. MARC CASAS: Marc Casas here. I'm  
4 just trying to get down what I have here is IR Number  
5 8.

6 Is that -- is that correct. And if --  
7 or is there...

8 MS. ERICA BONHOMME: I think -- I think  
9 we have IR-8 is to provide a -- a reviewed version of  
10 the CMH2 Hill report if it's appropriate. And the --  
11 the IR-9 is to provide a link to the Golder report --  
12 alternatives report.

13

14 --- INFORMATION REQUEST NO. 8: Provide a reviewed  
15 version of the CMH2  
16 Hill report if  
17 appropriate

18

19 --- INFORMATION REQUEST NO. 9: Provide a link to the  
20 Golder Associates  
21 Water Management  
22 Alternatives Report

23

24 MS. ERICA BONHOMME: And -- Erica  
25 Bonhomme. I should just summarize that for -- for

1 those that are not as well versed on -- on the history  
2 and what -- what's -- what all the information the  
3 current TDS Response Plan is based on, it is in Section  
4 4. Some of the key findings of our studies is provided  
5 in Section 4 of the TDS Response Plan that has been  
6 filed as part of this application.

7 DR. KATHY RACHER: Kathy Racher for the  
8 Board. I'm just wondering if we should hit the phones  
9 briefly.

10 Is there anyone from EcoMetrix that has  
11 questions at this stage?

12 MR. DON HART: This is Don Hart for  
13 EcoMetrix. I have a -- a few questions.

14 DR. KATHY RACHER: Okay. Kathy Racher  
15 here. Go ahead, Don.

16 MR. DON HART: My first question would  
17 be for Dr. Chapman. I think you mentioned that it  
18 would be nice to have some toxicity test -- or  
19 sensitivity information for copepods given that they're  
20 a dominant zooplankton species in the lake. You also  
21 mentioned, I believe, that you had some indications  
22 that they were less sensitive.

23 Could you elaborate on that and -- and  
24 perhaps provide a reference?

25 DR. PETER CHAPMAN: Peter Chapman. The

1 reference and the details were provided in the  
2 submission when we went through the TDS Response Plan  
3 and looked at the literature. It's in there and if you  
4 have trouble finding it I can look through and find the  
5 right page for you.

6 MR. DON HART: Listed in there, but if  
7 you could provide the page that'll help me out.

8 DR. PETER CHAPMAN: Peter Chapman. We  
9 don't need to take it as an IR. I'll look at it at the  
10 break and find it.

11 MR. DON HART: Thank you. It's Don  
12 Hart for EcoMetrix. I guess this might be a question  
13 for De Beers, but:

14 How confident at -- at this stage is De  
15 Beers that the proposed EQC and -- and the currently  
16 proposed surface SSWQO can be -- can be met? How  
17 certain are we of this?

18 MS. ERICA BONHOMME: Erica Bonhomme.  
19 We have evaluated a lot of different information. We  
20 know that TDS treatment is not difficult. It's -- it's  
21 very successful. It's very common. What we need to  
22 evaluate is its practicability and cost effectiveness  
23 against those things I mentioned on -- I'm just going  
24 to find it here -- on slide -- slide 6.

25 So we know it's effective. We don't

1 know how much it's going to cost us and what it's going  
2 to mean in terms of our infrastructure requirements.  
3 Obviously, every time we want to add a -- a piece of  
4 something to our site we have to go through a  
5 permitting process. So, you know, those are all things  
6 we have to evaluate. Is TDS treatment effective?  
7 Absolutely.

8 MR. DON HART: Okay. It's Don Hart,  
9 EcoMetrix. So it sounds like technically it's  
10 feasible. It may be a question of cost benefit.

11 MS. ERICA BONHOMME: Yeah. Slide 6  
12 summarizes all the things we need to take into  
13 consideration. The generation of waste is one (1) of  
14 the biggest ones. Obviously, all of the treatment  
15 technologies or all of the possible ways of achieving  
16 TDS treatment generate waste of some sort.

17 And we will -- you know, Snap Lake mine  
18 being a remote site, we need to manage that waste and  
19 be able to dispose of it effectively; that's our  
20 biggest consideration. We need to take into a cost --  
21 in -- into account energy consumption; that means fuel  
22 demands for us, greenhouse gas emissions. We want to  
23 evaluate what that adds, what -- what the offset then  
24 becomes. Whether we can recycle any of the energy  
25 that's used for this treatment.

1                   We want to look at the overall capital  
2   expenditure to add infrastructure both for, you know,  
3   taking the amount of water that we need off the main  
4   flow as well as the infrastructure requirements for  
5   treatment.

6                   And we need to look at all the things in  
7   the right -- in the green box there as well which is,  
8   is it reliable? Is it scalable? Is it effective? We  
9   -- we believe it's effective. Is it effective for TDS?  
10   Is it effective for -- do we need to look at its  
11   effectiveness for other parameters? Is it -- and --  
12   and do we have -- does it work with the seasonality of  
13   our road?

14                  MR. DON HART:    Okay.   Don Hart,  
15   EcoMetrix. Thank you for that. Just one (1) further  
16   question.

17                  So if we don't end up meeting the  
18   proposed EQC, I see that predicted peak concentrations  
19   may be as high as 1,700 milligrams per litre for the up  
20   -- upper bound scenario, I believe.

21                  It seems pretty clear that that would be  
22   sufficient to have appreciable effects on reproduction  
23   of the most sensitive species that we're aware of that  
24   seem to be the daphnids. The EAR, I believe, predicted  
25   that there could be minor changes in the zooplankton

1 community, but no loss of species.

2                   If we were to achieve those peak  
3 concentrations of 1,700 milligrams per litre, might  
4 this -- the threshold of significance, no loss of  
5 species, be crossed?

6                   MS. ERICA BONHOMME:     Erica Bonhomme.  
7 Yeah, we believe that. We've -- we've always -- De  
8 Beers is committed to protecting the aquatic life  
9 within Snap Lake. We -- we believe strongly that the  
10 site-specific water quality objectives we proposed will  
11 protect the aquatic life within Snap Lake. We wouldn't  
12 intend to exceed any EQCs that are issued as a result  
13 of -- of accepting or modifying the proposal we've put  
14 forward.

15                   I -- I don't expect we would ever  
16 achieve that -- the -- the modelling. The reason we --  
17 the model predictions without mitigation -- the reason  
18 we've done the modelling without mitigation is to show  
19 how -- how the levels increase over the short to medium  
20 term so that we can look at, for example, by when do we  
21 need to have mitigation in place. So that -- that's  
22 why we've -- we've shown you both of those. It's not  
23 with the intent that we would ever leave everything  
24 unchecked to attain those levels.

25                   MR. DON HART:     Okay. Thank you.

1 MS. ERICA BONHOMME: I just want to --  
2 Dr. Chapman has a response to the earlier question.

3 DR. PETER CHAPMAN: Yeah. Peter  
4 Chapman here. You wanted to know where that reference  
5 was to testing copepods.

6 MR. DON HART: Yeah.

7 DR. PETER CHAPMAN: If you go to the  
8 development of to -- total dissolved solids chronic  
9 effects benchmark for aquatic life in Snap Lake  
10 document dated December 2013. Go to page 7-4 and the  
11 reference there is Gallant and Robinson (phonetic)  
12 1983. Predicted effects of increasing salinity on the  
13 crustacean zooplankton community in Permit Lake, Nevada  
14 (phonetic). This is in the journal Hydrobiologica  
15 (phonetic). And interesting enough, there -- they  
16 tested the dominant calanoid copepod species in Snap  
17 Lake. So it was very relevant.

18 MR. DON HART: Okay. Thank you.

19 DR. KATHY RACHER: Kathy Racher for the  
20 Board. Don, do you have additional questions?

21 MR. DON HART: No, that's it for me.

22 DR. KATHY RACHER: Kathy Racher for the  
23 Board. I think -- well, I have a few more questions  
24 and maybe others do as well. But I'd like to take a --  
25 a short break till 3:30 please. Thanks.

1 --- Upon recessing

2 --- Upon resuming

3

4 DR. KATHY RACHER: Okay. Kathy Racher,  
5 for the Board. I'm just going to ask if Anita Li is on  
6 the phone and if she has any questions at this stage.

7 MS. ANITA LI: I -- I'm still on the  
8 phone, and I have a couple of questions. In slide 6,  
9 the -- De Beers have indicated that it's not practical  
10 to target footwall treatment.

11 And I was wondering, why is that?

12 MS. JULIE L'HEUREUX: Julie L'Heureux.  
13 So since the -- the headings in the footwall is so big,  
14 we can't segregate it properly. And I have a -- a  
15 reticulation system that could pump this water directly  
16 to surface. We would need a crew that would just  
17 install pipe on daily basis, and then we can't do this.  
18 We can't segregate this water in an operational side of  
19 -- of things.

20 MS. ANITA LI: Anita Li, from  
21 Environment Canada. Thank you. My second question is:  
22 In the presentations, I don't any -- I don't see any  
23 mention of the maximum daily limit of 1,003 milligrams  
24 per litre that De Beers is asking for.

25 Are you asking for this maximum daily



1 limit for TDS?

2 MS. ERICA BONHOMME: Erica Bonhomme.  
3 We will cover that in the EQC presentation. Yes, we  
4 are asking for a maximum daily limit.

5 MS. ANITA LI: Anita Li, from  
6 Environment Canada. That's all. Thank you.

7 DR. KATHY RACHER: Kathy Racher, for  
8 the Board. Go ahead, Matt.

9 MR. MATT HOOVER: Matt Hoover, North  
10 Slave Metis Alliance. So I just wanted to remind the  
11 Proponent that at the March 20th meeting at the  
12 Explorer Hotel, that we had requested a plain-language  
13 version of these studies and this report. And at the  
14 time, they told us it would be available prior to these  
15 meetings.

16 We haven't received one yet, so we would  
17 still appreciate receiving that, and ideally as soon as  
18 possible and with as much up-to-date information as is  
19 available. Thank you.

20 MS. ERICA BONHOMME: Erica Bonhomme.  
21 We did provide a plain-language summary as part of the  
22 supplemental filing on Friday. It's a plain-language  
23 summary of the application, including all of the models  
24 -- the models and all of the studies that went into  
25 developing the EQCs and the site-specific water quality

1 objectives. It's the -- it's first attachment of the  
2 Friday submission.

3 MR. MATT HOOVER: Matt Hoover, North  
4 Slave Metis Alliance. Okay. Thank you very much. At  
5 the time, it was said that it would be two (2) weeks  
6 prior to this, but I didn't see that in that Friday  
7 submission. So thanks a lot, and we will proceed to  
8 review that.

9 DR. KATHY RACHER: Kathy Racher. Do we  
10 have some more questions in the room? Zhong?

11 MR. ZHONG LIU: Zhong Liu, from SLEMA.  
12 How about go -- go to slide number 10. Yeah. So -- so  
13 because here's it's the mine water directly to puddle  
14 the mine water. That's mine water effluent from the  
15 current water treatment plant to -- to be treated in  
16 that MF, RO, and evaporation process, the low water or  
17 low main water or after current treatment?

18 MS. JULIE L'HEUREUX: Julie L'Heureux.  
19 So mine water, we assume that that would be after our  
20 water treatment plant. So the same -- just before it  
21 would go, let's say, to the diffuser, SNB17-2b, then we  
22 would have a T-junction that would feed the -- whatever  
23 option we would have to -- to choose to -- to treat our  
24 water.

25 And then we would bleed the line. But

1 we don't know yet the percentage of this feed bef --  
2 since the pilot tests are not done yet and the  
3 assimilation.

4 MR. ZHONG LIU: Thank you. My second -  
5 - my second ques -- Zhong Liu, from SLEMA again. My  
6 second question is slide 32.

7 So who did the first testing for  
8 daphnia, toxicity testing?

9 DR. PETER CHAPMAN: Peter Chapman here.  
10 You're asking who did the first test? It was done by  
11 Nautilus Environmental, who also did the second test.

12 MR. ZHONG LIU: Oh, okay. So who will  
13 be -- do the third testing?

14 DR. PETER CHAPMAN: Peter Chapman here.  
15 We'd like to have at least one (1) other -- have  
16 another lab do it, but we'd also like Nautilus to try  
17 and do it again. Ideally, we'd like to do more than  
18 one (1) test, so we'd like to have more than one (1)  
19 lab do the testing.

20 MR. ZHONG LIU: Thank you, because if  
21 the same lab did the same two (2) testing, so that  
22 meant -- also involves some kind of -- what kind of  
23 issue is that? So that's not a real repeatedly. I  
24 prefer see a third party from -- from the current.

25 DR. PETER CHAPMAN: Peter Chapman.

1 Noted.

2 DR. KATHY RACHER: Kathy Racher. We'll  
3 take a question from Rick first.

4 MR. RICK WALBOURNE: Rick Walbourne,  
5 GNWT. You mentioned, regarding the benchmark studies,  
6 that -- that data hasn't been published yet.

7 Can I conclude then that that has not  
8 been peer reviewed?

9 DR. PETER CHAPMAN: Peter Chapman.  
10 You're -- just so I understand the question, you're  
11 saying:

12 Have we sent things out for peer review  
13 and published from the site-specific water quality  
14 objective work?

15 Is that what you're asking?

16 MR. RICK WALBOURNE: Rick Walbourne,  
17 GNWT. Yeah. You mentioned that you were going to try  
18 to publish the site-specific water quality objective  
19 work, the benchmark studies. As it hasn't been  
20 published, that's my question.

21 Has it then been -- not been peer  
22 reviewed yet?

23 DR. PETER CHAPMAN: Peter Chapman. No,  
24 it hasn't. We recently, in fact on Thursday and  
25 yesterday, submitted two (2) papers to the journal

1 Environmental Toxicology and Chemistry to do with the  
2 strontium work.

3 One was submitted by Nautilus, which was  
4 relating to the testing they did, and the other was  
5 submitted by myself, related to developing a site -- a  
6 chronic benchmark for strontium for fresh waters  
7 globally based on the work we've done.

8 So that's in peer review, and it'll  
9 probably be a month and a half before we find out.

10 MR. RICK WALBOURNE: Rick Walbourne,  
11 GNWT. Okay. Thanks for that. Another question:  
12 Regarding the ceriodaphnia, can you clarify that data  
13 was disregarded because it was -- the species was not  
14 found in Snap Lake, or there was less weight applied to  
15 it?

16 Could you just run through that again  
17 briefly?

18 DR. PETER CHAPMAN: Yeah. Peter  
19 Chapman. The history of daphnia, ceriodaphnia, is  
20 this: Daphnia is a twenty-one (21) day test, and it  
21 was a standard test for a lot of years. And then EPA,  
22 US EPA was concerned that, gosh, it was too expensive,  
23 it was too hard to do, and cost too much.

24 So they thought they'd develop a test  
25 with ceriodaphnia dubia, which was developed by a

1 fellow called Don Mount, as a seven (7) day test. And  
2 that's considered a more sensitive test than the  
3 daphnia. It's quite sensitive.

4 It's actually run in Perier water  
5 usually. And the reason it's run in Perier water,  
6 interestingly enough, is because US EPA wanted to find  
7 a water for the controls that could be run universally.  
8 And that's also, just by the by, as a little trivia,  
9 how they discovered benzine was a problem in Perier  
10 water on the control side. But anyway, that's how I  
11 get into trivia.

12 Todd, you like that, don't you? He  
13 likes trivia.

14 But anyway, you know, the bottom line is  
15 we just -- we -- we gave it less weight because the  
16 daphnia are found there. Is the twenty-one (21) day  
17 test. Daphnia found there, ceriodaphnia aren't.

18 MR. RICK WALBOURNE: Rick Walbourne,  
19 GNWT. Okay. That's -- that's fine.

20 MR. SEAN WHITAKER: Sean Whitaker,  
21 Environment and Natural Resources. Just following up  
22 on Rick's question about the ceriodaphnia, I know you  
23 quoted that the CCME protocols were used as part to  
24 develop the SSWQOs.

25 Do either the 2003 or 2007 CCME

1 documents describe procedures for deriving the SSWQOs  
2 that permit the exclusion of toxicity data for  
3 taxonomic groups that are present in low abundance in a  
4 receiving water body?

5 DR. PETER CHAPMAN: Peter Chapman.  
6 They -- basically, when you're developing the -- the  
7 2007 -- I haven't look at the 2003 for a while. But  
8 the 2007 certainly does clearly say that when you're  
9 developing regional and so on, you want to focus on the  
10 ones that are present that are most likely to be  
11 affected. You exclude the ones that are going -- not  
12 going to be present or not relevant.

13 So that's certainly something that can  
14 be done. It's something that's done universally in the  
15 literature when looking site specifically.

16 MR. SEAN WHITAKER: Sean Whitaker,  
17 Environment and Natural Resources. Thank you for that.  
18 I'm just -- I'm trying to read and digest it all at the  
19 same time, so I'm sorry.

20 I did have one (1) other question about  
21 chloride. And I -- forgive me, I've been back and  
22 forth between the presentation and my documents and  
23 trying to compile everything, because there's a large  
24 stack of paper that you guys submitted with this  
25 application, which is appreciative, but it's a lot to

1 digest all at the same time while we're going.

2 But the CCME water quality guideline for  
3 chloride is not hardness dependent. What evidence has  
4 been provided to demonstrate that the toxicity of  
5 chloride is hardness dependent at Snap Lake?

6 DR. PETER CHAPMAN: Peter Chapman. If  
7 you go back to the CCME chloride document, what they  
8 say in there -- and I'm paraphrasing; I don't have it  
9 in front of me. But basically, what they say is that  
10 there is a relationship with hardness. But there  
11 wasn't a sufficient relationship that they could  
12 develop hardness as an exposure toxicity modifying  
13 factor for all of Canada.

14 But in that document, it does say that,  
15 you know, regions, et cetera, are free to try to  
16 develop it and if they can show it works. And,  
17 basically, you know, in terms of the work that Elphick  
18 et al did in 2011, that's pretty conclusive. And  
19 certainly, that went through a fair bit of review  
20 during the Ekati water licence technical sessions and  
21 hearings and was accepted.

22

23 (BRIEF PAUSE)

24

25 MR. SEAN WHITAKER: Sean Whitaker,



1 Environment and Natural Resources. I'm going to see if  
2 anyone else has any questions for now. I just have to  
3 keep synthesizing the information as we go, but thanks.

4 MR. TODD SLACK: Todd Slack, for the  
5 Yellowknives. So many questions from the other  
6 questions have spurred two (2) new thoughts for me.

7 And the discussion around slide 6 --  
8 this is the -- the feasibility testing -- I'm just  
9 wondering if the project can explain -- I -- I note --  
10 note that greenhouse gas emissions are one (1) up  
11 there. And I don't understand, 1) how they're going to  
12 be valued, or 2) how they trade off against TDS, even  
13 in a -- a short, conceptual phase.

14 I'm wondering if you can talk about that  
15 for one (1) sec.

16 MS. ERICA BONHOMME: Erica Bonhomme.  
17 It's a good question. Whether or not we would base a  
18 decision on -- or whether we would base a decision  
19 solely on increased greenhouse gas emissions due to a  
20 treatment, it -- it's unlikely. It would be part of a  
21 package of things.

22 But given -- taking into consideration  
23 that we have to transport fuel to site, we have to  
24 transport all the infrastructure needed to implement a  
25 facility on site; to run the facility, which we would

1 expect -- we have no numbers at all, but -- but to run  
2 the facility itself in terms of fuel consumption; as  
3 well as to potentially reduce the waste stream to a  
4 manageable level through the generation of a -- a  
5 crystal product; as well as then to take that off site  
6 for disposal; I think that we -- we know that,  
7 particularly the -- the piece of the project that would  
8 be on site would have a contribution to greenhouse  
9 gases.

10                   We would -- that is part of what we  
11 would ask the -- to be evaluated in the concept study,  
12 so we will have a number for that. Like I said, it's -  
13 - it's unlikely to be a sole consideration in a  
14 decision on what technology to implement.

15                   MR. TODD SLACK: Thanks. Todd Slack  
16 for the Yellowknives. And hearing what you've said, it  
17 sounds like this isn't actually an issue about  
18 greenhouse gas emissions. This is an issue about  
19 dollars: cost to get fuel there, cost of construction.

20                   So would it be fair to -- to condense  
21 this list down to operating costs and like costs of  
22 purchasing, costs of transport? Because the -- the  
23 question that is really of interest to me is: What  
24 value does water quality have then as -- as part of  
25 this? Why would you go 1 -- 1 microgram/litre of TDS

1 removal more if the benefits are only being assessed in  
2 costs? And that's what I want to try and understand.

3 How do environmental factors fit into  
4 this cost-benefit analysis?

5 MS. ERICA BONHOMME: Erica Bonhomme.  
6 So again, the site-specific water quality objectives  
7 that we've proposed are protective of the aquatic  
8 environment. So that's bottom line. We -- so that  
9 takes care of the benefit side of the equation. We're  
10 not proposing to, you know, monkey with -- with those  
11 numbers in any way.

12 A hundred and eight (108) -- 188  
13 million, which is our -- our previous estimate for the  
14 capital and operating cost of a -- of a -- a full  
15 treatment solution, is uneconomical. That's -- that's,  
16 you know, bottom line.

17 However, we would -- cost is always a  
18 consideration for us. These are all the things that  
19 are going to have to be considered. We -- given the --  
20 given that we know we -- if the Board accepts our  
21 proposal, that we will have a level to treat to, we  
22 will look for the most cost-effective solution to get  
23 there.

24

25 (BRIEF PAUSE)

1 MS. ERICA BONHOMME: Erica Bonhomme.

2 And -- and just a clarification, that 188 million was  
3 not an operating cost estimate. It was only a capital  
4 cost estimate.

5 MR. TODD SLACK: Thanks for the clarity  
6 on that. That's pretty direct, and that's well  
7 appreciated. My -- my last thought here is, so the  
8 Health Canada guideline is an aesthetic guideline: 500  
9 millilitres -- no, not millilitres -- milligrams per  
10 litre.

11 The closure objectives for this site  
12 also includes an aesthetic issue -- or an aesthetic  
13 objective: that the -- the landscape will match the  
14 aesthetics of the surrounding natural area.

15 So two (2) questions then: 1) How long  
16 after the -- the cessation of operations will Snap Lake  
17 exceed this aesthetic guideline; and then 2) Does the  
18 project view this exceedance of the aesthetic guideline  
19 as acceptable within that closure objective?

20 MS. ERICA BONHOMME: Erica Bonhomme.  
21 Just maybe, Todd, provide some clarification. Do you  
22 mean the aesthetic objective for the water quality that  
23 we're talking about?

24 MR. TODD SLACK: There are two (2)  
25 aesthetic issues here: the Health Canada 500 mil --

1 milligrams per litre; and then, within your closure  
2 objectives set forth by the Land and Water Board,  
3 there's a landscape aesthetic objective attached to  
4 that.

5                   So if you're exceeding the Health Canada  
6 guideline, does the project believe that they are  
7 meeting the closure objective that is set out by the  
8 Board? That's question number 2.

9                   MS. ERICA BONHOMME:   Erica Bonhomme.  
10 The -- the closure plan does not address water quality  
11 from an aesthetic objective. I'm -- I -- I think  
12 you're -- you're mixing things up. The -- the -- and I  
13 apologize. I may just be misinterpreting what you're -  
14 - you're getting at, but the -- the closure plan refers  
15 to an on-site visual aesthetic objective.

16                   The aesthetic objective from a Health  
17 Canada perspective and water quality deals with water.  
18 Our closure plan does not address water quality, in  
19 terms of an aesthetic objective.

20                   MR. TODD SLACK:   Todd Slack, with the  
21 Yellowknives. Okay. Just to be clear, the project  
22 doesn't view Snap Lake as part of the landscape?

23                   MS. ERICA BONHOMME:   Erica Bonhomme. I  
24 -- it is. I would argue that it would be difficult to  
25 establish that Snap Lake would exceed an aesthetic

1 objective based on a visual observation.

2 DR. KATHY RACHER: Kathy Racher, for  
3 the Board. I'm just going to intervene because I -- I  
4 think this is a little off topic. If -- if you think  
5 that the objective should be the aesthetic objective,  
6 then you should present that case to the Board.

7 Do you have further questions, Todd?  
8 Okay Then -- then it's my turn.

9

10 (BRIEF PAUSE)

11

12 DR. KATHY RACHER: Kathy Racher, for  
13 the Board. Okay. On the -- the slide number 6, where  
14 it says the initial findings targeted footwall  
15 treatment is not practicable under current mine  
16 operating conditions, I just want to confirm for the  
17 record that in -- in your TDS response plan in Section  
18 2.4(2), it -- it did make it sound like that was the  
19 preferred option, was source -- treatment at the source  
20 of the footwall water.

21 And so -- but you've done work  
22 subsequent to this submission to determine that. So  
23 that's new evidence, but that's -- that's your current  
24 understanding?

25 MS. JULIE L'HEUREUX: Julie L'Heureux.

1 That's correct. We were still investigating at the  
2 time, and then we have confirmation that operational is  
3 not -- we -- we couldn't do it under the operational  
4 mining sequence at the moment.

5 We can't close the ramp every day to  
6 install pipes, so, yeah. It's more like an operational  
7 than a cost for that purposes, actually.

8 DR. KATHY RACHER: Kathy Racher, for  
9 the Board. Okay. Thank you. One (1) of my -- if we  
10 go to slide 14 on this presentation, it's about the  
11 timeline of, really, the analysis for the mitigation  
12 options for TDS.

13 And -- so I'm looking at the time lines,  
14 and I'm a little concerned. Going in -- I mean, one  
15 (1) of the -- one (1) of the basic principles of the  
16 Mackenzie Valley Board's water and effluent quality  
17 management policy is that -- that we set effluent  
18 quality criteria that are reasonably and consistently  
19 achievable. And I think what I'm seeing here is we're  
20 not going to know what's reasonably and consistently  
21 achievable by the end of this year.

22 So, I -- I mean, you've asked for an EQC  
23 and -- and you've said that that's -- that's the one  
24 you're going to meet. But in the absence of  
25 information that you can actually achieve that --

1 because currently I'm not seeing any information. You  
2 haven't done predictions on what the treatment -- if  
3 you did treat a fraction of -- of your water for TDS,  
4 if it would work.

5 I -- I know you say -- I'm -- I'm well  
6 aware of treatment technologies TDS, so I understand  
7 they are effective. But because of the practical  
8 considerations, it sounds like you -- you haven't  
9 committed to doing anything in particular. You're  
10 still -- you know, you're still evaluating, which is  
11 fair enough.

12 But I'm just wondering how we're going  
13 to set an EQC for you when we really have no evidence  
14 that you can meet it?

15 MS. JULIE L'HEUREUX: Julie L'Heureux.  
16 So, yeah, we actually undergoing the pilot tests as we  
17 speak, but it's still a long process. So to determine  
18 what's the volume that we will need to treat, we need  
19 to do those pilot tests first because we -- we brought  
20 some mine water off site. So we, you know, filled some  
21 totes of actual mine water, and then they're doing the  
22 test with -- really with our water.

23 So in -- in order to understand the  
24 parameters, and -- and then after they -- let's say we  
25 -- we do a first pass, and then the RO can reach a



1 recovery of 95 percent. Then the result will then  
2 apply to the simulation. And then we'll be able to  
3 say, Okay, by Q4, we know that we need to -- to treat,  
4 let's say, 15 percent of our total outflow of our  
5 discharge. And then for -- we need this kind of unit  
6 to treat this water.

7                   So we are doing the -- the tests, but in  
8 order to have the real numbers -- we will achieve the -  
9 - the EQC -- EQC, but we just need to know the  
10 percentage of it by doing the pilot tests. Is it going  
11 to 10 percent, 12 percent, 15 percent?

12                   But RO's been on the market for the  
13 thirty (30) last year, and we know it's effective for  
14 TDS. So for the -- for us, it's not a problem. It's  
15 just to understand with our water how it's going to --  
16 how it's going to actually be achievable and in which  
17 sense.

18                   So the work is undergoing, and we will  
19 be -- it's just a matter of the percentage of the --  
20 the bleeding after the test is completed.

21                   MS. ERICA BONHOMME: Erica Bonhomme.  
22 So -- but one (1) of the things -- chicken and egg  
23 perhaps. But, you know, we're assuming -- we're doing  
24 this work with the assumption that we have a site-  
25 specific water quality objective of six eighty-four

1 (684).

2 If you say -- if you tell us -- in the  
3 end, the Board says, No, six eighty-four (684) isn't  
4 going to work, then we're back to square 1.

5 So we have to take some steps to move  
6 that process forward with some assumptions. One (1) of  
7 our key assumptions is that the site-specific water  
8 quality objectives we proposed will be implemented.  
9 That helps us with that cost-benefit analysis that we  
10 have to undertake.

11 So it's not -- but it's not the overall  
12 -- we -- we believe, as Julie as has said, the  
13 treatment will be effective. It's all the different  
14 combinations of processes that get us to that final  
15 treatment that we have to sort out.

16 The site-specific water quality  
17 objective, as Alison has pointed out, will be exceeded  
18 sometime after 2016. So this timeline shows that by --  
19 we will -- we will be ready with implementation in 2015  
20 if we take through these steps.

21 So we know that we can have something in  
22 place prior to the point when we would exceed that  
23 site-specific water quality objective. We just can't  
24 tell you exactly what that is right now.

25 DR. KATHY RACHER: Kathy Racher, for

1 the Board. With -- with reference to the time of when  
2 the water quality objective is expected to be exceeded,  
3 is that -- that's the time when it's exceeded in Snap  
4 Lake. What about the time that it's exceeded at the --  
5 the EQC that you've proposed is -- is going to be  
6 exceeded?

7 Because some of the graphs I've seen of  
8 mine water in the predictions show it could be like any  
9 moment. So can you -- I haven't been able to find a  
10 really specific graph that showed me exactly when the  
11 effluent, which is what you're proposing, as -- as an  
12 eff -- as an EQC, is going to exceed the water quality  
13 objective because that -- that times into the -- the  
14 timing as well.

15 MR. ZHONG LIU: Zhong Liu, from SLEMA.  
16 In January, SLEMA issue a letter about this issue, EQC  
17 achievability. We identified at least two (2) instance  
18 in 2013 that -- that were above De Beers's proposed  
19 EQC.

20 That's why we recommend it's just -- the  
21 -- met your timeline for the EQC, not the -- because if  
22 -- what the Board approve, if that six eighty-four  
23 (684) milligram per litre is the EQC, still, in 2015,  
24 before De Beers is start any TDS removal for solidity,  
25 that -- there's a high chance of possibility De Beers

1 will exceed that EQC.

2 That -- that's published in our -- in --  
3 in the Board website, and that's dated January --  
4 that's a letter dated January 16.

5 DR. KATHY RACHER: Kathy Racher, for  
6 the Board. Right. And, I mean, I -- I mean, the  
7 transient -- it's a transient one. So I guess what I'd  
8 -- exceedances. So I do take your point, and it is  
9 part of my concern, for sure.

10 So that's why I guess what I'd like to  
11 see is a comparison of your -- of your time line, both  
12 of -- of designing your potential options, implementing  
13 and commissioning against the predictions of the  
14 effluent water quality.

15 I just want to know like, going forward,  
16 especially for the Land and Water Board process, where  
17 -- you know, how we're going to make decisions and when  
18 we're going to make decisions. And, you know, should  
19 we wait on a certain piece of information? Because,  
20 you know, we don't want to get in the position where we  
21 assign an EQC, and then six (6) months later we've got  
22 to do this all over again, because I've got better  
23 things to do.

24 So if you could comment on that, or if -  
25 - is that something you could undertake as an IR, just

1 to spell that out for us just very clearly?

2 MS. ERICA BONHOMME: Erica Bonhomme.

3 We can do that. We can match some -- some modelled  
4 values against this stepped process. But something to  
5 keep in mind for us is that we do have some fairly  
6 restrictive limits that come into effect January 1st,  
7 2015, in our current licence. And for us, I mean,  
8 we've presented a lot of evidence here that suggests  
9 that those are -- those are not practically achievable  
10 for us.

11 DR. KATHY RACHER: Kathy Racher, for  
12 the Board. Yeah, point taken. One (1) of the other  
13 things I -- I noticed in your -- in your supplemental  
14 information that you provided on April 11th, you -- in  
15 -- in sort of the accidents and malfunctions section,  
16 you accounted for the possibility that there would be  
17 sort of a malfunction for a year, say -- I think it was  
18 2017 or something, and another year, that if -- if you  
19 discharged unmid -- untreated -- 'untreated' meaning  
20 not -- not including specific TDS mitigations, what  
21 would be the effects? And you went through the  
22 magnitude and severity and reversibility and whatnot,  
23 which was -- which was helpful.

24 But I guess what I'd like to see is that  
25 done for the unmitigated case going forward right now.

1 You -- you have predictions of what the water quality's  
2 going to be in Snap Lake. Just -- I think -- I think  
3 it would be helpful, especially for MVEIRB, frankly, to  
4 understand what the effects would be if none of those  
5 mitigations pan out.

6 I mean, given that we haven't -- we  
7 don't have substantial information saying, These are  
8 the mitigations specifically that we are committed to  
9 doing at this cost, and they're going to work in  
10 exactly this way. We don't have that information.  
11 What we do have is a lot of data showing us the  
12 direction of where things are going right now. And --  
13 and it shows that they're going to exceed water quality  
14 objectives. Exceeding water quality objectives in  
15 themselves doesn't -- is not an end to the lake. We  
16 know that.

17 So -- so where in the spectrum of -- of  
18 effects would that lie if -- if you didn't treat at  
19 all, if you didn't do additional mitigations? I'm not  
20 suggesting that that's the right thing to do. I'm --  
21 I'm just saying that it would helpful for the Board to  
22 know what that would look like.

23 And -- and I say this because I don't  
24 want to lead us all in a direction where, you know, the  
25 Review Board comes out with another number that in two

1 (2) years you can't meet for some reason that you don't  
2 know about yet. And then, you know, again we'll end up  
3 back here because they said a num -- say they accept  
4 six eight-four (684). Maybe they'll call that number  
5 as the number, and then we'll be back in the EA again.

6 Do you see what I mean?

7 MS. ERICA BONHOMME: Erica Bonhomme.  
8 Yeah, that -- that's helpful. And -- and certainly,  
9 you know, we'd like the opportunity to present -- you  
10 know, I think that's a good question. We can do that.

11 As well, though, I think we can -- we'd  
12 like to have the opportunity to present information  
13 that -- that might suggest that the aquatic life within  
14 Snap Lake can -- can tolerate a higher level of TDS and  
15 potentially other parameters that have been compared to  
16 what's been proposed here.

17 But I should emphasize that this work is  
18 proceeding. We are committed to developing technology  
19 that will meet the current proposed EQCs. As Julie  
20 said, you know, people can come to us and say they can  
21 grow pineapples in Yellowknife. We -- we believe that.  
22 They -- and anything's possible.

23 What we need to evaluate is -- is, from  
24 a -- a business perspective, what makes the most sense  
25 for us.

1 DR. KATHY RACHER: Kathy Racher, for  
2 the Board. Okay. So, Marc, did you capture the two  
3 (2) IRs, then? One is to compare the timeline for the  
4 development of the TDS potential mitigations to end of  
5 pipe achievability of effluent at the site.

6

7 --- INFORMATION REQUEST NO. 10: De Beers to compare  
8 timeline for the  
9 development of TDS  
10 potential mitigations  
11 to end of pipe  
12 achievability of  
13 effluent at the site

14

15 DR. KATHY RACHER: And the second was  
16 to provide evidence -- well, what do we call it -- an  
17 assessment of what the potential effects to Snap Lake  
18 and -- and relevant water bodies downstream if -- if  
19 the -- if no additional mitigations are in place at the  
20 Snap Lake Mine.

21

22 --- INFORMATION REQUEST NO. 11: De Beers to provide  
23 an assessment of  
24 potential effects to  
25 Snap Lake and



1 relevant water bodies  
2 downstream if no  
3 additional  
4 mitigations are in  
5 place at the Snap  
6 Lake Mine

7

8 DR. KATHY RACHER: Peter...?

9 DR. PETER CHAPMAN: Yeah. Peter

10 Chapman here. April 30th is the deadline to submit  
11 IRs. Based on the testing to date that we've shown as  
12 -- we're not looking -- we've never tested as high as  
13 seventeen hundred (1,700). We tested up to about  
14 thirteen (13), fourteen hundred (1,400).

15 And at that level, the main issue is  
16 really daphnids, Cladocerans. So we can reply by April  
17 30th, absent Cladocerans, because we'd like to do some  
18 more testing to complete the answer for them. We can  
19 put it in perspective, as we did in the documentation  
20 we provided about what percentage -- which is a very  
21 small percentage of the zooplankton they comprise  
22 related to food for fish.

23 But, you know, we can't give a complete  
24 answer, in my opinion, by April 30th without doing some  
25 additional testing.

1 DR. KATHY RACHER: Kathy Racher, for  
2 the Board. Just -- you know, what you have at the  
3 moment to evaluate, I think, would be fine. Based on  
4 that point as well, though, I know that, your TDS  
5 results notwithstanding, there's a lot of evidence on  
6 the record separately for chloride.

7 And so that assessment should be done  
8 with respect to anything that's going to exceed a water  
9 quality objective, including chloride, which is  
10 currently pre -- predicted to exceed the water quality  
11 objec -- its water quality objective, the hardness-  
12 dependent one, which is already relatively high, the  
13 one that was developed by Elphick et al.

14 So I'd like to see the assessment in  
15 that -- in that frame, too. And there's a lot more  
16 data, I know, on other organisms, such as fish, et  
17 cetera, for that water quality objective.

18 MR. MARC CASAS: Yeah, Marc Casas here,  
19 from the Board. I just want to -- I'm just trying to  
20 get these IRs sort of worded maybe correct. And I just  
21 -- in terms of what I have down as IR 10, which is I  
22 guess the graph of the EQC timeline compared to -- to  
23 when the exceedance is going to occur, I'm wonder if  
24 that -- was that only for TDS, or did you also want  
25 that for chloride?

1 DR. KATHY RACHER: Kathy Racher, for  
2 the Board. I -- I think it's the same. It's the same  
3 time line because it's the same treatment, so it's  
4 fine. Just for TDS is fine.

5

6 (BRIEF PAUSE)

7

8 DR. KATHY RACHER: Okay. Any follow-up  
9 questions? Zhong...?

10 MR. ZHONG LIU: One (1) more question  
11 about water quality issue, because we are talking about  
12 the impacts from the mining on the quality of life and  
13 human being. Now our Elders is concerned about whether  
14 they will have some impacts on wildlife from drinking  
15 the water of Snap Lake.

16 So I'm wondering whether De Beers could  
17 provide some information about drinking water quality  
18 for wildlife, and also some research on impacts on  
19 caribou, bears, something like that.

20 DR. PETER CHAPMAN: Peter Chapman here.  
21 The main issue is really total dissolved solids -- in  
22 other words, salinity -- which wouldn't be a factor  
23 that would harm the animals directly. It's a matter of  
24 taste. The interesting thing is, I think most people  
25 are aware, that elk, caribou, and so on like salt

1 licks. Salt licks are fairly important for them, you  
2 know, to get salt in.

3 So we don't have any direct research.  
4 We haven't done any research on wildlife. But  
5 certainly, given the fact that those animals seek out  
6 salt licks, seek out those, we don't think there'd be  
7 any inhibition of them drinking. And there certainly  
8 isn't an effect -- you know, a problem of them being  
9 hurt by drinking the water.

10

11 (BRIEF PAUSE)

12

13 DR. PETER CHAPMAN: Peter Chapman here.  
14 And I just got reminded that there is a guideline for  
15 cattle that's much higher, at 1,000 milligrams per  
16 litre.

17

18 (BRIEF PAUSE)

19

20 DR. PETER CHAPMAN: Peter Chapman. I'm  
21 going to be corrected.

22

23 (BRIEF PAUSE)

24

25 DR. PETER CHAPMAN: Peter Chapman.

1 I've got it wrong twice. I'm going to let Tasha Hall  
2 get it right.

3 MS. TASHA HALL: Tasha Hall, with  
4 Golder Associates. Just a correction that it's -- the  
5 CCME guideline for livestock watering is 3,000  
6 milligrams per litre.

7 MR. ZHONG LIU: Zhong Liu with SLEMA.  
8 I notice that in your report, the cut -- the cut line  
9 for cattle is 1,000 milligram per litre TDS.

10 DR. KATHY RACHER: Is there any further  
11 questions on -- on the -- this section? It's 4:15 and  
12 we're all excited about TDS.

13

14 (BRIEF PAUSE)

15

16 DR. KATHY RACHER: I think, just to  
17 make sure that we've got enough time tomorrow, we're  
18 going to force you to go on with the -- the Nitrogen  
19 Response Plan presentation. I -- I realize that we  
20 made a mistake in the agenda, and we had -- we had two  
21 (2) -- two (2) spots where you're presenting it.

22 So actually, if you present it today,  
23 we'll be relatively on time. If we don't get to  
24 questions or through all the questions, that's fine.  
25 We'll take that up tomorrow, but we will end today at

1 4:30, or -- no. 4:30? Wait a sec. 4:45, sorry.

2

3 (BRIEF PAUSE)

4

5 PRESENTATION - NITROGEN RESPONSE PLAN:

6 MS. ERICA BONHOMME: Erica Bonhomme.

7 This presentation begins on the second -- second

8 attachment that was provided. It's dated April 16.

9 It's the first presentation on the April 16 attachment.

10 So again, the Nitrogen Response Plan is  
11 a requirement that was required to be provided as part  
12 of the water licence. Again, similar to the TDS  
13 Response Plan, it required that De Beers develop and  
14 recommend appropriate water quality objectives for  
15 ammonia and nitrate in Snap Lake derived from toxicity  
16 testing, and that De Beers recommend EQCs for ammonia  
17 and nitrate to be applied end of pipe, SNP station 02-  
18 17, that would ensure the protection of aquatic life in  
19 Snap Lake.

20 The conclusions of these required  
21 studies has led De Beers -- no, we're not recommending  
22 higher EQCs. There's an error on that presentation.  
23 We're not recommending higher EQCs for nitrogen. My  
24 apologies. We -- we'll refer back to the table where  
25 we -- where we present the EQCs, because there's -- it

1 varies.

2                   The full results are provided. The full  
3 results of the site-specific water quality objectives  
4 are provided in the report called, "Development of  
5 Nitrate Chronic Effects Benchmark of Aquatic Life in  
6 Snap Lake."

7                   So in terms of nitrogen, again, as part  
8 of the requirement of the TD -- of the Nitrogen  
9 Response Plan, we needed to talk about the sources of  
10 nitrogen and the management practices for nitrogen.

11                   The primary source of nitrogen at Snap  
12 Lake is from blasting activities conducted underground.  
13 The predicted loading is presented in the model  
14 scenarios. It's derived from the Site Water Quality  
15 Model report and the Upper and Lower Bound Groundwater  
16 Model scenarios.

17                   The majority of nitrate loading to Snap  
18 Lake is from underground. Oh, sorry, I haven't changed  
19 my slides. Slide 3. Seventy-two (72) -- about three  
20 (3) quart -- 72 to 77 percent, about three-quarters  
21 (3/4s) of the ammonia loading to Snap Lake is from  
22 underground. The remainder of the nitrate and ammonia  
23 loading comes from deposition of processed kimberlite  
24 to the North Pile. Nitrogen loading, along with the  
25 other parameters, is expected to increase over life of

1 mine.

2                   Since nitrogen loading is primarily due  
3 to the use of explosives, the primary means to manage  
4 nitrate load -- nitrogen loading is to reduce -- is to  
5 improve blasting efficiency underground. Since over  
6 the last couple of years we have reduced the number of  
7 holes per blast round, we've reduced emulsion  
8 overloading in those blast holes, and we've engaged in  
9 a practice to remove and reuse old emulsion from  
10 underground for surface blasting activities. Temporar  
11 -- we can also temporarily reduce the concentration of  
12 nitrogen in mine water through controlled dilution.

13                   Slide 4. The studies we've done to  
14 minimize that -- that investiga -- minimizing nitrogen  
15 loadings to the environment include a pre-feasibility  
16 comparison of certain effluent treatment technologies,  
17 similar to the ones for TDS; a pre-feasibility  
18 screening which will include an expansion of the system  
19 to treat for TSS; a capital and cop -- and operating  
20 cost estimate; and evaluation of technologies similar  
21 to that required to treat for TDS.

22                   We've also looked at implementing  
23 potentially a targeted treatment at the water  
24 management pond where most of the nitrate -- nitrates  
25 collect.



1 I'll pass it over to Dr. Peter Chapman.

2

3 (BRIEF PAUSE)

4

5 DR. PETER CHAPMAN: Peter Chapman here.

6 So we're now looking at slide 6, and I'm going to be

7 fairly brief, about six (6) slides.

8 Basically, what we did in terms of

9 nitrate is the Ekati mine has developed a site-specific

10 water quality objective for nitrate that's based on

11 hardness. They haven't published that, and we wanted

12 to make sure that this was applicable to Snap Lake.

13 So what we did is we did testing with

14 two (2) of -- there were three (3) sensitive species.

15 We did testing with two (2) of the sensitive species,

16 most sensitive species that Ekati found, using Snap

17 Lake water and adding nitrate to see whether the Ekati

18 would apply to Snap Lake.

19 And basically, what we found -- I'm

20 showing now Figure 7. And on Figure 7, you can see

21 nitrate concentration up the left-hand side, hardness

22 up on the right. This figure is taken right from the

23 Ekati submission for their water licence and how

24 they've developed their site-specific water quality

25 objective.

1                   The only difference is, if you look at  
2 the legend in the square box at the bottom, the red box  
3 that says, "Invertebrate Data - Snap Lake," you can see  
4 two (2) square boxes here that are above the dashed  
5 line. And then the second one, you see the diamond,  
6 the blue diamond, fish data for Snap Lake. You'll see  
7 the blue diamonds here.

8                   So basically, what we showed was that  
9 with Snap Lake water, this also applied. And basically  
10 what this is, is as hardness increases up to a level of  
11 a hundred and sixty (160) -- and they didn't test  
12 higher than that, so we just go up to one sixty (160) -  
13 - as long as you're above this line, you're fine.  
14 You're not having an effect.

15                  So we found that sensitive species. And  
16 basically what we've set out at 160 milligrams per  
17 litre hardness is a nitrate site-specific water quality  
18 objective of sixteen point four (16.4). To put that in  
19 perspective, the maximum nitrate concentration in May  
20 of last year was three point o (3.0), and the maximum  
21 predicted nitrate concentration is ten (10).

22                  And I'm just going to show you a couple  
23 of graphs that Alison produced that we didn't -- we  
24 pulled out of her presentation. And this shows nitrate  
25 concentration, left-hand side, in years following along

1 the bottom for both of them. One is near the diffuser,  
2 the other is the outlet.

3                   You can see the top line in both of them  
4 would be the site-specific water quality objective  
5 which is based on hardness. And hardness does increase  
6 past one sixty (160), so it levels out. At the lower  
7 level -- this is without mitigation -- you can see the  
8 predicted nitrate concentrations. And they're well  
9 below the site-specific water quality objective.

10                   Ammonia, very simple. We really didn't  
11 do anything that fancy with it. We know ammonia's  
12 toxicity is modified by pH and temperature, the cold  
13 exposure toxicity modifying factors by the Canadian  
14 Council of Ministers of the Environment. We basically  
15 set the site-specific water quality objective based on  
16 the CCME water quality objective. Five point two-one  
17 (5.21) is the chronic, and the maximum predicted  
18 ammonia concentration is two point seven (2.7). So  
19 again, we're not looking at an exceedance there.

20                   And that's the end of my presentation.

21                   MS. ERICA BONHOMME: It's Erica  
22 Bonhomme. I just wanted to provide a clarification on  
23 slide 8, Peter, if you can scroll me back, please. One  
24 (1) more back. No, keep going, yeah. Right in the  
25 front end of the -- keep going. The ta -- yeah. Keep

1 going. Okay.

2                   So my apologies. On slide 2, I -- I  
3 just want to clarify that De Beers is not seeking a  
4 change in the ammonia EQC. It's seeking an increase in  
5 the nitrite EQC, and it's seeking a -- it -- it's  
6 recommending a -- a decrease in the nitrate EQC.

7

8                   (BRIEF PAUSE)

9

10 QUESTION PERIOD:

11                   DR. KATHY RACHER: Kathy Racher, for  
12 the Board. Okay. Thank you for that. We've got some  
13 lights on. That's good.

14                   I think I'm going to go to the phone  
15 first and -- in deference to our colleague in Ontario,  
16 who probably wants dinner. Don Hart, are you there?  
17 Do you have any questions about the Nitrogen Response  
18 Plan?

19                   MR. DON HART: Don Hart, EcoMetrix.  
20 Just a couple of questions. First question pertains to  
21 the site-specific toxicity testing that was done to  
22 verify the nitrate objective for Snap Lake waters, and  
23 I guess this might pertain to slide number 7, where the  
24 -- the data are shown, including the site-specific test  
25 data.

1                   Testing was done at two (2) water  
2 hardness levels, 140 and 350 milligrams per litre, as  
3 calcium carbonate. I believe under upper bound  
4 scenarios, the hardness may get even higher, to levels  
5 of around nine fifty (950). I stand to be corrected.  
6 That's reading from graphs.

7                   But I guess what my question is, is:  
8 How confident are we that the testing at three fifty  
9 (350) is representative, or at least conservative, as  
10 compared to the results we might get at a hardness much  
11 higher, around nine fifty (950)?

12                  The -- the reason I would bring this up  
13 is I look at the testing that was done for the most  
14 sensitive species, the ceriodaphnia zooplankton  
15 reproduction test, the IC-20 was 26 milligrams per  
16 litre nitrate nitrogen at a hardness of one fifty  
17 (150), down to 16.7 milligrams per litre at a hardness  
18 of three fifty (350).

19                  Does it keep going down at higher  
20 hardness levels such that we would have detect levels  
21 below the proposed site-specific objective?

22                  DR. PETER CHAPMAN: Peter Chapman. We  
23 didn't test at the higher levels. Frankly, we don't  
24 know because it levels out at that point. And you're  
25 right, the ceriodaphnia is down there right on the

1 line. The fathead minnow is way up there, however. So  
2 we don't have those testing points.

3 MR. DON HART: Yeah, it's -- I mean,  
4 basically, we're assuming that it levels out. I'm just  
5 questioning whether it really does. And the -- I'm --  
6 when I say this, I'm thinking of the -- the BC  
7 guideline for sulphate, which is also hardness  
8 dependent. And they define it up to a hardness of two  
9 fifty (250).

10 They have concerns about higher hardness  
11 levels and whether we may be getting those combined  
12 toxic and -- and hardness effects at -- at those high  
13 levels. So it's -- it's a concern.

14 DR. PETER CHAPMAN: Peter Chapman.  
15 It's a potential issue. I go back to TDS. The TDS we  
16 did test up to fifteen hundred (1,500), nominal  
17 fourteen hundred (1,400), and we did see no effects on  
18 most everything except the daphnids again.

19 DR. KATHY RACHER: Kathy -- Kathy  
20 Racher, for the Board. Don, did you have a follow-up  
21 question for that?

22 MR. DON HART: Yes. Well, I'm -- I'm  
23 trying to -- I'm trying to understand the -- the --  
24 your response about TDS there, Peter.

25 Are you saying that it helps us to

1 answer the question about nitrate at high hardness  
2 levels?

3 DR. PETER CHAPMAN: Peter Chapman. No,  
4 I'm saying it -- it helps address the issue of hardness  
5 by itself. It doesn't address the issue of hardness  
6 and nitrate together.

7 MR. DON HART: Don Hart, EcoMetrix.  
8 Okay. Understood.

9 Don Hart, EcoMetrix. I have one (1)  
10 other question. We've done -- or you've done site-  
11 specific toxicity testing with a number of species,  
12 including the daphnid invertebrates and fathead minnow,  
13 the daphnid invertebrates being the more sensitive  
14 species.

15 Again, we know that's not the dominant  
16 zooplankton out in the lake. Those would be rotifers  
17 and copepods. Do we have any information about nitrate  
18 sensitivity for either of those species?

19 DR. PETER CHAPMAN: Peter Chapman. I'm  
20 going to have to take that as IR and look that up and  
21 get back to you on that, if I may.

22 MR. DON HART: Don Hart, EcoMetrix.  
23 Thank you.

24 DR. KATHY RACHER: Kathy Racher, for  
25 the Board. Don, could you just repeat what that IR

1 would sound like for us, please?

2 MR. DON HART: To find information  
3 about nitrate toxicity to rotifers and copepods as  
4 dominant zooplankton in Snap Lake.

5

6 --- INFORMATION REQUEST NO. 12: De Beers to provide  
7 information on  
8 nitrate sensitivity  
9 for rotifers and  
10 copepods

11

12 DR. KATHY RACHER: Kathy Racher, for  
13 the Board. Thank you. Do you have any further  
14 questions right now, Don?

15 MR. DON HART: No, that's it.

16 DR. KATHY RACHER: Okay. Thank you.

17 Anita Li, from Environment Canada, do  
18 you have any questions at this time?

19

20 (BRIEF PAUSE)

21

22 DR. KATHY RACHER: Apparently she's not  
23 there. I'll take that as a no.

24 In the room here, who's lively enough to  
25 at this stage -- oh, Todd's lively enough. Excellent.



1 MR. TODD SLACK: Thanks, Kathy. Todd  
2 Slack, for the Yellowknives. Excuse me. All my  
3 questions are going to focus on the amount of  
4 explosives used and the source control efforts.

5 What has the explosives per tonne  
6 monitoring shown us? I didn't -- I see that you are  
7 monitoring this information, but I don't see where it's  
8 reported. Can we get some information on that?

9

10 (BRIEF PAUSE)

11

12 MS. ERICA BONHOMME: Erica Bonhomme.  
13 We -- we currently don't have any, you know,  
14 information we provide regularly to the Board. I'd  
15 have to go back and see what kind of records on that we  
16 -- we would provide -- we could provide.

17 MR. TODD SLACK: Todd Slack, for the  
18 Yellowknives. And perhaps this is helpful. On page  
19 11, Section 2.3, the project states that you will  
20 continue to monitor trends in the amount of explosives  
21 used per tonne -- per tonne of ore mined.

22 Should I -- if this information is not  
23 available, is this a misprint here?

24

25 (BRIEF PAUSE)

1 MS. ERICA BONHOMME: Erica Bonhomme.  
2 Sorry. The reason I'm hesitating is -- is I don't have  
3 that information. None of us do here. We do hire a --  
4 a third party that manages our explosives, so we obtain  
5 information from them. So I need to go back and -- and  
6 see in what format that information exists. We do have  
7 that information. It's just through a third party.

8 MR. TODD SLACK: So -- sorry. Todd  
9 Slack, for the Yellowknives. I'm wondering if we can  
10 have as an IR that looks at both what this monitoring  
11 shows us and how this monitoring is going to be done,  
12 both now and in the future.

13 DR. KATHY RACHER: Kathy Racher, for  
14 the Board. And to clarify, that's for monitoring of  
15 the amount of explosives used during mining?

16 MS. ERICA BONHOMME: Yeah. Erica  
17 Bonhomme. I'll be a little more specific than that.  
18 We -- we will have numbers on the amount of emulsion  
19 that's used based on amount that's -- that's purchased  
20 and shipped to site, and trends based on that, so  
21 specific to emulsion.

22 MR. TODD SLACK: Todd Slack, for the  
23 Yellowknives. And if that can be -- the key here is on  
24 a per-tonne basis, because -- and I'll explain my -- my  
25 intent here. In the last -- in the water licensing

1 process, there was an awful lot of discussion in terms  
2 of source control, and we're going to reduce the amount  
3 of stuff that we use, and all these sort of things.

4 And what I'm trying to understand is  
5 have these initiatives been successful in reducing the  
6 amount of nitrogen loadings in the last few years?

7 MS. ERICA BONHOMME: Yeah. Erica  
8 Bonhomme. We will -- we'll provide some information  
9 that helps to answer that question.

10 MR. TODD SLACK: Todd Slack. Thank  
11 you. That's terrific. And I'm wondering if I might  
12 push that a little further. In -- throughout Section 2  
13 in this plan, you talk of all these initiatives. And  
14 so there -- there is some -- some metrics there, in  
15 terms -- like if you use less drill holes, you  
16 therefore use less emulsion.

17 But what we aren't getting at is  
18 understanding whether -- which of these initiatives  
19 have been successful, in terms of reducing or improving  
20 the -- the blast mechanics or the blast efficiency.

21 So I don't know if you wanted to add it  
22 -- add on to that or -- or create a separate question,  
23 but that -- that's the -- the bigger goal, not just  
24 explosives per tonne, but how each initiative has  
25 worked to effect that -- that ratio or that value,

1 metric, whatevs (sic).

2

3 (BRIEF PAUSE)

4

5 MS. ERICA BONHOMME: Erica Bonhomme.

6 We -- one (1) thing -- one (1) thing is we can't -- we

7 can't break down to just assess which one of those

8 practices is more effective than the other. They're

9 all effective at reducing loadings to the environment.

10 Now, when you look at figure -- the

11 figures provided in the -- in the Nitrogen Response

12 Plan -- I just want to make sure I have the right ones

13 -- these ones, they do continue to show an increase.

14 And then historically -- and -- so I'm looking at

15 Figure 2-3, Figure 2-4 of the Nitrogen Response Plan,

16 which deal with nit -- nitrate and ammonia loading in

17 the final mine water collection sump. So that's where

18 water comes from underground and is monitored.

19 So you see for example Figure 2-4a, we

20 still continue to see an increase. What it doesn't

21 reflect is the fact that we continue to open new areas

22 to mining. Our -- our mining increases. We continue

23 to get inflows. We continue to have more areas opened

24 up to mining.

25 So there's a -- there's a balance

1 between reducing bla -- improving blast efficiency and  
2 -- and reducing loading, and the fact that we're --  
3 we're increasing the rate of mining.

4 MR. TODD SLACK: Todd Slack, with the  
5 Yellowknives. I guess if we take that and if you could  
6 provide that information, both how the -- sorry, I need  
7 to think this through a little and not chill off like  
8 that last one.

9 So if the issue is that the loading is  
10 going up because of a rate of mining increase, can the  
11 project provide, complementary to these other data in  
12 something that is -- we can see the relationship, can  
13 the project provide metrics that show that rate of  
14 increase, rate of mining increase, and whether that is  
15 the root source of the nitrate increases?

16

17 (BRIEF PAUSE)

18

19 MS. ERICA BONHOMME: Oh, I left my mic  
20 on. Erica Bonhomme. Yeah, I think we can provide  
21 something like that. I'm -- I'm not giving an exact of  
22 what we can provide, because we need to go back and  
23 look at how we would answer that question.

24 What we do have is a mine plan. We do  
25 have all our groundwater and site models, which are

1 based on that mine plan. They don't separate out  
2 nitrogen currently. We've done mining, and -- and the  
3 Groundwater Model has -- has taken into account TDS.

4 So how -- you know, we increase our  
5 loadings based on the mine plan. We need to take that  
6 back and see what that will look like.

7 The amount of explosives that we use,  
8 like I said, that's information we can get quite  
9 easily. It's the part about correlating it over the  
10 long term to the -- to the loadings. Should -- should  
11 be fairly straightforward, but I don't want to commit  
12 to providing any one (1) specific graph or -- or, you  
13 know, correlation, because I -- we need to take that  
14 back and see what...

15 But my -- I think your question is: How  
16 will nitrogen loading -- maybe -- maybe I don't  
17 understand the question. Maybe -- maybe you could just  
18 rephrase the question for me --

19 DR. KATHY RACHER: Kathy --

20 MS. ERICA BONHOMME: -- so just so I'm  
21 clear what you're looking for.

22 DR. KATHY RACHER: Kathy Racher, for  
23 the Board. Maybe I could try something here. Have you  
24 got it?

25 MR. TODD SLACK: I -- I had -- Todd

1 Slack, for the Yellowknives. I had the good fortune of  
2 a few extra seconds there to think about it. So the  
3 question is: If -- if the project's explanation is  
4 that it is the rate of mining that is driving the  
5 increase in loading, can they please provide  
6 information that pro -- explains that rationale or that  
7 justification?

8 Is that a fair request?

9 MS. ERICA BONHOMME: Erica Bonhomme.  
10 Yeah, we can do that.

11 DR. KATHY RACHER: Kathy Racher, for  
12 the Board. Just before we go on, I just want to  
13 clarify. So that -- the IR about the amount of  
14 emulsion per tonne, is that still something you're  
15 looking for as well? Okay. You're nodding your head.

16 MR. TODD SLACK: Yes, please.

17

18 --- INFORMATION REQUEST NO. 13: De Beers to provide  
19 information on amount  
20 of emulsion per tonne

21

22 --- INFORMATION REQUEST NO. 14: De Beers to provide  
23 information  
24 supporting the  
25 explanation that it

1 is the rate of mining  
2 that is driving the  
3 increase in loading  
4

5 DR. KATHY RACHER: Okay. Did you have  
6 another question, Todd? And I think we'll -- we'll end  
7 it after that.

8 MR. TODD SLACK: I have one (1) last  
9 question. Sorry, Todd Slack, with the Yellowknives.  
10 And that last question is: Section 5 in -- in the  
11 Nitrogen Response Plan talks about what you could do,  
12 further source control issues.

13 And I guess the question that I have is:  
14 Why are we considering moving the goal posts for this  
15 again without looking at these source control issues  
16 and seeing how they implement -- or how they can be  
17 implemented prior to further consideration, in terms of  
18 allowing additional contamination of the -- the  
19 receiving environment?

20 MS. ERICA BONHOMME: Erica Bonhomme. I  
21 -- I should clarify again, we're not actually  
22 increasing our limit. So if you look at the  
23 concordance table in the water licence application,  
24 we're not looking for an increase in the EQC for  
25 ammonia. We're looking for a dec -- we're recommending



1 actually a decrease in the EQC for nitrate and a minor  
2 increase in -- in the EQC for nitrite.

3 MR. TODD SLACK: Todd Slack, with the  
4 Yellowknives. You'll have to forgive me that I don't  
5 understand the -- the interplay between these various  
6 nitrogen values.

7 My -- my sense is that, hey, if you're  
8 blowing more stuff up, that's where the nitrogen's  
9 coming from. And whether it be nitrite or nitrate or  
10 ammonia or some other 'N' value, the root cause is the  
11 -- or the root source is the explosives.

12 And while I don't want to belabour  
13 this...

14 DR. KATHY RACHER: Kathy Racher, for  
15 the Board. I -- I think I had a question that was  
16 along the same line as what I think you're getting at,  
17 Todd. In terms of the EQC, the EQCs are set to lower  
18 for nitrate in 2015 to a lower level than what they're  
19 currently proposing. But that was based on the water  
20 quality objective that we dealt with at the time of the  
21 renewal, so that's -- that's what the EQC was based on.

22 But it's -- I think it -- for me, in  
23 terms of ongoing nitrate management, I mean, that's --  
24 we identified during the renewal that the rate of  
25 explosive use was much higher than we'd seen at other

1 mine sites. It was like a rate of 25 percent sort of  
2 wastage. And -- and there's -- you know, it's --  
3 there's a lot of water, and I get that, et cetera.

4 So -- and -- and what you've outlined in  
5 your Response Plan is a number of things that you could  
6 do, you are doing, you're working on. And -- and in  
7 your recommendations, as Todd pointed out, it says:

8 "To continue to monitor trends in the  
9 amount of explosives used per tonne  
10 of ore mined as a means of monitoring  
11 the effectiveness of explosives  
12 management measures."

13 And -- and I guess what we're trying to  
14 incorporate more into water licences is -- is that kind  
15 of -- how do you know you're doing better? So how do  
16 you know anything that you're doing is actually  
17 worthwhile? And, you know, you go down a certain path;  
18 maybe that doesn't work. You go down another path.

19 So how as you as a -- how do you as a  
20 mine -- how are you going to monitor going forward that  
21 you're doing the right things at the right times? And,  
22 you know -- and -- and we have begun to ask for that  
23 information in the annual reports, just, you know, not  
24 a -- a big, detailed report, but just a -- a general  
25 indication.

1                   So what would you monitor and how would  
2 you -- how -- how do you know that anything you do is  
3 effective? And -- and could you either talk about that  
4 or provide a -- a recommendation for how that could be  
5 incorporated in the water licence? And that might help  
6 with Todd's questions.

7                   MS. ERICA BONHOMME: Yeah. I think the  
8 Response Plan is a perfect place to -- to look at that.  
9 It's something that, you know, we want to -- it is  
10 before the Board for review now.

11                  If there is -- if that's the  
12 recommendation that is -- is the best one for reporting  
13 on that, I think that we -- we can provide you with  
14 numbers annually on the -- the amount of emulsion used  
15 versus the tonnes of ore mined.

16                  However, I want to be clear, we would  
17 not want to see that as a compliance point. We are  
18 committed to improving our blast efficiencies and  
19 reduce the nitrate loadings where we can. But we -- we  
20 most certainly would hope that we wouldn't have our  
21 feet held to the fire over that.

22                  DR. KATHY RACHER: Kathy Racher, for  
23 the Board. Paul tells me he has two (2) questions, but  
24 we did commit to ending it at 4:45. I don't know how  
25 people feel, if they're okay with -- with two (2) very

1 short questions from the young man at the end.

2 Okay. Go ahead.

3 MR. PAUL GREEN: It's Paul Green with  
4 ENR. For blasting, do you use 100 percent emulsion or  
5 an ANFO/emulsion mix underground?

6 MS. ERICA BONHOMME: Erica Bonhomme.  
7 Let's be clear, I'm -- I'm not a -- a blasting expert.  
8 Yes, we use ANFO, as well as a -- an emulsion mix  
9 underground.

10 MR. PAUL GREEN: Have -- just going  
11 back to other mine sites, they've done a fair bit of  
12 work looking at, you know, the emul -- the  
13 emulsion/ANFO blend. Do you know if much of that type  
14 of work has occurred at -- at Snap?

15 Like I think an 80:20 emulsion/ANFO  
16 seemed to be kind of the magic number, as far as  
17 minimizing leachate -- leaching of ammonia and nitrogen  
18 compounds.

19 MS. ERICA BONHOMME: Erica Bonhomme. I  
20 mean, one (1) -- one (1) thing I would just say off the  
21 bat is we're a very different mine. We have a lot of  
22 water underground. I can't say that what would work at  
23 other mines would work -- necessarily work at Snap  
24 Lake.

25 If we go back to Todd's point of it's

1 all about cost, the same would apply here. We -- we  
2 don't want to waste any explosive residue -- explosive;  
3 we don't want to waste emulsion. It's expensive for  
4 us. It's expensive for us to bring it in, and it's  
5 expensive for us to manage it.

6 So just on that basis, we definitely  
7 want to be as efficient as we can. We also want to  
8 ensure that every blast round is as effective as it can  
9 be. So if we have an incomplete blast, it means we  
10 have to wait till a shift change and do it again.

11 So, you know, I -- I believe that our --  
12 our blasting techniques are continuously improving and,  
13 you know, are -- are designed to be as effective as  
14 they can be.

15 MR. PAUL GREEN: Thank you. Another  
16 quick one about residence times. You have a feel for  
17 how long the explosives remain in the hole after  
18 they're charged, like hours, days, less than a week  
19 kind of...?

20 MS. JULIE L'HEUREUX: Julie L'Heureux.  
21 It's a few hours. It's just the -- the day shift prior  
22 to the blast at four o'clock in the afternoon.

23 DR. KATHY RACHER: Kathy Racher, for  
24 the Board. Okay. Then I think we should wrap it up  
25 here. And we'll start again at nine o'clock in the

1 morning. We'll -- if we have any follow-up questions,  
2 we'll -- we'll take care of them then and then get on  
3 with the presentation on the Strontium Response Plan.

4 Question from Peter?

5 DR. PETER CHAPMAN: Peter Chapman.

6 Just first thing in the morning, could we review the  
7 IRs just to make sure we're all on track in the  
8 morning?

9 DR. KATHY RACHER: Kathy Racher, for  
10 the Board. Yeah, we'll -- we'll take a look at them  
11 tonight and see if we can write them -- you know, have  
12 something written down to see if they -- they match.  
13 So we'll try to do that in the morning.

14

15 (BRIEF PAUSE)

16

17 DR. KATHY RACHER: Kathy, for the  
18 Board. I -- I think we can -- I -- I wouldn't  
19 recommend leaving anything valuable in here, but -- I'm  
20 not saying that your application is not valuable. It  
21 is. But we can probably leave our big binders here in  
22 the -- in the -- in this room until tomorrow if -- if  
23 you don't want to lug them around town.

24 So thanks, everyone, for a great session  
25 today. Thank you for the great presentations and --

1 and the questions and answers. See you tomorrow.

2

3 --- Upon adjourning

4

5

6 Certified Correct,

7

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11 Wendy Warnock, Ms.

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<u>\$</u>	165:17	<b>1,487</b> 163:3	<b>119</b> 6:7	229:17
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