NATURAL RESOURCES CONSERVATION BOARD

Application No. 1701

SPRINGBANK OFF-STREAM RESERVOIR PROJECT

P R O C E E D I N G S

Volume 6

March 29, 2021

(Via videoconferencing)

Natural Resources Conservation Board Proceedings taken virtually in Calgary and Edmonton, Alberta.

Volume 6

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(PROCEEDINGS COMMENCED AT 8:30 A.M.)

THE CHAIR: Well, good morning, everybody, and welcome to day 6 of the SR1 hearing, Monday, March 29th.

So, hopefully, everybody had a reasonable weekend and didn't have too far to drive on this day, given the incredible gusts and the winds out there today. So, in some cases, I guess the virtual hearings can be helpful, at least for those of us -- many of us that don't have to travel too far.

A couple of notes, and then I'll ask for any prelim matters, but one thing is our -- our document managers, in our view, are doing a wonderful job to getting us documents up, and we at times need to jump around a lot, which is just the nature of the beast, but I would like to ask everyone to have some patience.

In some cases, the exhibits being requested are not necessarily preloaded, and so we do need to load

them from the web, it does take some time. So, as I say, I think they're doing a wonderful job, but just so we don't put too, too much pressure on them, if we can cut them a little slack and show some patience, we'd really appreciate that.

Undertakings, we had some undertakings returned. We will have a look at the ones that have been returned and be sure they've been entered as exhibits; if they have not, we'll bring them back, so that we can enter them as exhibits.

And for the undertakings that will be coming back over this week, or any new ones that are asked for and then returned, if we could ask for those to be brought back to the hearing, and we'll just enter them at that time, give them an exhibit number so that we can ensure that our record is complete and tracked.

As last Friday noted, given the virtual world, we have some exhibits being entered sort of on the fly, and that's really on us, so we've cleaned that up a bit. The record is fine, I think we're all good, but we just want to make sure that we're doing this in as orderly a fashion as we can.

So we did leave off last week getting ready for Transportation to cross-examination SCLG and Mr. Austin.

But before we get there, are there any preliminary matters that anyone wants to raise this morning before we get started with that?

MS. OKOYE: Yes, Mr. Chair. Good morning. It's Ifeoma Okoye.

Mr. Dowsett has some clarifications to make to his testimony on Friday. I propose that he makes those clarifications before the cross begins. I have asked Mr. Fitch about that, and he's okay with that.

But that is if it's okay with you, we can have that done before Mr. Fitch can proceed with his cross.

THE CHAIR: Mr. Fitch, you've seen this, and you're in agreement?

MR. FITCH: Yes.

THE CHAIR: Thank you. Yes, please. Proceed.

R. AUSTIN, R. KEYES, D. KLEPACKI, I. DOWSETT (For SCLG Panel), previously sworn/affirmed

MS. OKOYE EXAMINES THE PANEL:

Q. Mr. Dowsett, are you there?

A. MR. DOWSETT: Yes, I am.

Q. Could you please proceed with your clarifications?

A. MR. DOWSETT: Yes, thank you, and good morning.

There's some clarification I wanted to make to my testimony on Friday. These corrections will clarify

the record.

In Exhibit 373, PDF 1335, on line items 12 to 16, I said the following: (as read)

"...on the current requirements and, as a result of my -- as a result, I included a summary of those components based on my experience in pages 9 and 10 of my report for the purpose of asking questions to ensure that appropriate EMS was in place.

In looking at the directive, it checks all the boxes for me, and I find the materials in my report are redundant."

The page references on line 14 are incorrect. It should be pages 11 and 12, and these pages of my report are redundant.

The correction should be: (as read)

"...on the current requirements and, as a result, I included a summary of those components based on my experience in pages 11 and 12 of my report for the purpose of asking questions to ensure that appropriate EMS was in place.

In looking at the directive, it

checks all the boxes for me, and I find pages 11 and 12 of my report are redundant." Further, in Exhibit 373, PDF 1338, lines 24 to 25, I said the following: (as read) "...and my report does not represent my testimony."

I misspoke. I meant to say: My report does not accurately represent my testimony because of the corrections that I had made to it. As such, my report should be considered together with my testimony. Thank you.

MS. OKOYE: Thank you, Mr. Dowsett. Mr. Chair, that will be all.

THE CHAIR: Thank you, Mr. Dowsett. Ms. Okoye, thank you. Mr. Fitch, is Transportation ready to cross-examine?

MR. FITCH: Yes, Mr. Chair, we are. And I'll start with Mr. Austin so he can get off to his dam site or job site, whatever it is he needs to do.

MR. FITCH CROSS-EXAMINES THE PANEL:

Q. So I understand your consulting -- consulting engineering company is located in Trail, BC; correct?

A. MR. AUSTIN: That is correct, yeah.

Q. And before you started Austin Engineering, you worked at Fortis in Trail?

A. MR. AUSTIN: That's actually South Slocan, halfway between Trail and Nelson, yes.

Q. And I also note that you worked in Revelstoke?

A. MR. AUSTIN: Yes. That wasn't for Fortis. That was for Peter Kiewit Sons Construction Company.

Q. Right, okay. So should I take it from the choices of all the places that you've worked that you're a skier?

A. MR. AUSTIN: I do ski from time to time, but not nearly as good as my kids.

Q. Revelstoke and Red Mountain are two of my favourite hills. So, anyways, with that little bit of tomfoolery out of the way.

So, in your CV, you list several dam projects that you've worked on at Austin Engineering since 2014, and you would agree with me that all of those projects are in BC, not Alberta?

A. MR. AUSTIN: That is correct, yes.

Q. So I'm really just asking these questions to get a sense of how familiar you are with the process used in Alberta to approve and regulate dams. Could you tell us that?

A. MR. AUSTIN: Yeah. So it's a fair question.

Specifically we've not gone through the approval process within the jurisdiction zone of Alberta or specifically, you know, in this jurisdiction; however, you know, we have worked across Canada in Ontario, in BC, and in the US, and I'm familiar with kind of the designing principles and safe operating principles of dams.

The actual permitting process, you are correct in suggesting that we have not gone through the permitting process in Alberta.

Q. Okay. So are you aware that in Alberta, approval to construct and operate a dam must be authorized under the *Water Act*?

A. MR. AUSTIN: I will take your word for that?

Q. Okay.

A. MR. AUSTIN: I believe that's correct, yeah.

Q. And are you aware that in Alberta, dam and canal safety is regulated under Part 6 of the Water Ministerial Regulation?

A. MR. AUSTIN: I'm not familiar with the exact part, but I believe that to be correct?

Q. Now, I did see in your presentation reference to the dam and canal safety -- the Alberta Dam and Canal Safety Directive, so I take it you have at least reviewed that document?

A. **MR. AUSTIN: Yes.**
Q. And were you familiar with it before this job or did you really review it for, more or less, the first time in order to prepare for this particular task that you've undertaken for the SCLG?
A. **MR. AUSTIN: I would say that we reviewed it in detail to prepare for this task for the SLC [verbatim].**
Q. Okay, thank you. And, sir, I guess, really, the point of all this is are you aware that, under the Water Ministerial Regulation and the Alberta Dam and Canal Safety Directive, that it is Alberta Environment and Parks that regulates dam safety, not the NRCB?
A. **MR. AUSTIN: I am aware of that. I -- that was something that was discussed early on. I do realize that this is a little out of step in terms of the permitting process, but I'm certainly aware of that.**
Q. And in your report that you prepared for the SCLG, Austin Engineering made a number of recommendations. And, sir, would you agree with me that whether or not those recommendations should be accepted is actually up to the director of dam safety, not the NRCB?
A. **MR. AUSTIN: I do agree with that statement. I think, you know, the purpose of our review was to inform SLCG [verbatim] what the risks were and potential improvements for the dam, and I believe that**

their intent was to utilize those to ensure that they felt safe, and maintained a sense of safety downstream of the structure.

Q. Okay, thank you.

Now, sir, given that Austin has accepted many of the responses from Stantec to your recommendations, I don't think there's actually too many areas where you and Stantec are in any kind of material disagreement. Would you agree with that?

A. MR. AUSTIN: I would not quite agree with that. I think there's two areas that we are still in a little bit of disagreement here.

Q. And would they be the diversion inlet design and the emergency spillway design?

A. MR. AUSTIN: I -- I would suggest that the diversion inlet design is simply a caution that needs to be reviewed and confirmed. I would suggest that they are the emergency spillway and, you know, the potential for an additional outlet as a low-level outlet.

Q. So I'm going to ask a few questions about the diversion inlet, though I do appreciate your comment that it's more a caution than anything.

And these questions might be better addressed to Ms. Keyes since she was the one who testified about

this.

Ms. Keyes, are you with us this morning?

A. **MS. KEYES: Yes, I am.**

Q. And so you have expressed a concern about the diversion inlet capacity; correct?

A. **MS. KEYES: Yes, that's correct.**

Q. And as I understand it, you recommend that the access bridge design be reviewed to ensure that adequate freeboard between the bridge and the water surface is achieved during passage of the design flow of 600 metres cubed per second. Do I have that right?

A. **MS. KEYES: On day 4 of the hearing, I believe Mr. Menninger addressed that by indicating that the bridge was designed to have the flow hit the bridge.**

Q. Okay. So can we say that you're now good with this point; you don't have any further outstanding concerns?

A. **MS. KEYES: From the point of dam safety, no.**

Q. Thank you.

I'll stay with you, Ms. Keyes, because again you're the one I think that wrote the report and raised this as a concern. So I want to turn to the emergency spillway design.

And, as I understand it, you say in your report that the emergency spillway maximum discharge capacity of 360 metres cubed per second is less than the

in-stream design flow; correct?

A. MS. KEYES: That is correct.

Q. And that based on the Canadian Dam Association Dam Safety Guidelines, the spillway of a dam must be able to discharge the IDF while maintaining the minimum freeboard; right?

A. MS. KEYES: With a consideration of reservoir routing, yes.

Q. Yeah. And you suggested in your report that the design of SR1 does not meet the Canadian Dam Association Dam Safety Guideline requirement; correct?

A. MS. KEYES: That is my belief, yes.

Q. Is that still your belief after hearing all the evidence to date?

A. MS. KEYES: Yes, it is.

Q. Okay. And so you've already alluded to it, but Stantec responded to your concern by basically saying we took into effect the routing -- or we considered the routing effect of the reservoir; correct? You've heard them say that?

A. MS. KEYES: Yes, I have. And they say that taking into effect the routing effect of the reservoir, the emergency spillway and reservoir can safely pass the probable maximum flood without relying on the diversion inlet gates closing and, while maintaining

adequate freeboard, this meets the CDA design guidelines and the industry standard of practice. You understand that that's Stantec's position?

A. MS. KEYES: I understand that's Stantec's position.

Q. All right. So you obviously don't accept that. And, as I understood your testimony on Friday, the reason you don't accept is is because your position is that the design of the emergency spillway should include a flood routing through the spillway that starts with the reservoir at full service level, and then you route the IDF; correct?

A. MS. KEYES: That is correct.

Q. Okay. And the IDF is the probable maximum flood; right?

A. MS. KEYES: The IDF in this case is 600 metres cubed per second, which is a portion of the PMF.

Q. Okay, all right. So, Ms. Keyes, you understand, I'm sure, that the operating approach for the project is that the diversion inlet gates will be closed when the reservoir is full?

A. MS. KEYES: Provided that power is maintained and that the operator's able to operate the gate, then yes.

Q. Okay. And you also understand, I'm sure, that SR1 is

an off-stream reservoir that only accepts flow into the diversion channel when the gates are opened by the operator; correct?

A. MS. KEYES: That is correct.

Q. Okay. So opening the gates to allow the probable maximum flood into the channel and reservoir when the reservoir is already full would go against the designed operating procedures for the project, would it not?

A. MR. AUSTIN: May I take this one, Gavin?

So I believe -- you know, what we're trying to suggest here is Stantec has routed the flood from a near empty reservoir. They also considered the 480 cubic metre per second, which we understand is their ideal operating inflow into the diversion, and in the figure they provided in our -- to their -- to us for their response, they allowed seven hours to the loss of diversion control.

Now, I agree that the loss of diversion control is a low probability. I -- I know that 480 is the probable and best optimized case, but I believe that's -- that starting from near-empty seven hours to loss of diversion control and minimizing the gates' intake to 75 percent are three pretty major assumptions for the design of the spillway. And we're simply suggesting that there needs to be a sensitivity

analysis. What happens if that reservoir is not empty.

You know, the US Bureau of Reclamation recommends that, when routing, you either start at a full-service or full-supply level, or you start at the level the reservoir would be expected to be at with half the IDF entering the reservoir before the flood. Now, neither of those is empty. Now, I agree that this is an off-stream reservoir and that you could defend the potential for it to be empty.

Any one of those assumptions on their own is defendable, but there needs to be a sensitivity analysis to look at, you know, what happens if we do start at a different level? What happens if we do allow the gates to be fully open?

And, you know, we realize that we're constrained by the hydrograph from the time the flows begins at that 160 to the time that peak has passed and we're no longer taking water in.

I simply think that the spillway needs to be considered from a sensitivity analysis standpoint to see whether or not that 360 metres cubed per second is capable of passing the idea if we change any one of those assumptions.

Q. Would you agree with me, Mr. Keyes [verbatim], that your suggestion that the sizing of the spillway should

be based on reservoir routing starting with the IDF entering the reservoir when it is full is appropriate for an in-stream dam, but the difference here is that we're dealing with an off-stream dam?

A. MS. KEYES: I'm not sure who your question was addressed to.

Q. Either of you.

A. MS. KEYES: Roger, I'll let -- do you want me to take this one?

A. MR. AUSTIN: No, I can take that one.

So I do agree that there is some inherent additional safety with an off-stream reservoir. The ability to lower the weir and discharge flows downstream is certainly a consideration in terms of where we begin that actual service level when we start to apply the flood; however, I believe that starting at a near empty reservoir is not as conservative as Stantec suggests.

Q. Well, let's try to break down your position here, Ms. Keyes and Mr. Austin.

So, as I understand it, the scenario that you're suggesting that should be looked at, at least from a sensitivity analysis perspective, is you start with a full reservoir; correct?

A. MS. KEYES: That would be great to see.

Q. Yeah. And that's a condition that has a recurrence interval of approximately once every 200 years; correct?

A. MR. AUSTIN: Yes, correct.

A. MS. KEYES: Actually, it depends on the operation of the diversion inlet. The recurrence interval of the reservoir filling depends on the operator's decision to open the gate. That could be -- that could be every year if they wanted to.

The recurrence interval in the river would be different to the recurrence interval of the operator opening the gate.

Q. Well, I'm sure the operator can open the gate at many different times, but the point is there's only one scenario we're interested in, which is that the gates are open and it fills to the full supply level. And that recurrence is every once every 200 years approximately; correct, Ms. Keyes?

A. MS. KEYES: I cannot verify that.

Q. You cannot verify that. Okay. So we start with the position -- the point that you say that the analysis should begin with a full reservoir. Then after that, your scenario would have us then say, in addition to the full reservoir, now there's a probable maximum flood entering through the diversion channel into the

reservoir; correct?

A. MS. KEYES: I think it would be more accurate to say the design inflow of 600 metres cubed per second as a portion of the PMF.

Q. And we've already talked about the fact that the operational plan for the reservoir is to close the gates when the reservoir is full, so there would have to be some sort of error in the operations that resulted in the gates remaining open for this additional 600 metres cubed per second to come into an already full reservoir; correct?

A. MS. KEYES: As operational error, could be a human error, an instrumentation error, or loss of power, then yes, correct.

Q. And then there would have to be a failure of the gates to close without any intervention for almost four days of inflow at 600 metres cubed per second; correct?

A. MS. KEYES: If the reservoir is empty, at 600 metres cubed per second, it takes 36 hours for the reservoir to fill.

Q. So three days, not four days?

A. MS. KEYES: One and a half days, I believe.

Q. Oh, right, sorry. In any event, the point is, the reservoir is full, and the operating plan is that the gates will be closed.

And your scenario, which you say should be looked at, is the gates actually are open, the water continues to flow into the reservoir for, you say, 36 hours even though that's not the plan at all, and there would be no closure of the gates even though that would also be the plan?

A. **MS. KEYES: On day 4, I believe Mr. Menninger mentioned that at 160 metres cubed per second, the gates are opened, and then they're closed once the reservoir reaches its full service level.**

Q. Right. I'm not sure you and I are hearing each other, Ms. Keyes.

The reservoir -- you say that the, as I understand it, that the design of the emergency spillway ought to have been undertaken in terms of the routing analysis with the starting point that the reservoir's already full; right?

A. **MS. KEYES: That is correct.**

Q. Yeah. And the point is that's not at all how the reservoir is intended to be operated. You would agree with that?

A. **MS. KEYES: I can neither agree nor disagree. The operation is based on a set of criteria based on the flow within the Elbow River upstream of the diversion structure.**

The decision to open and close is based on flows, and then the decision to close is based on reaching the full service level.

Q. And you understand that the gates would fail closed, and that they don't need power; it would be a manual thing?

A. MS. KEYES: I believe there are manual release on the hoist brakes, yes.

Q. So in the final analysis, then, do I take it your recommendation, Ms. Keyes, is that when the director of dam safety is looking at this, he or she should at least consider whether or not Stantec ought to have undertaken its routing analysis for the design of the emergency spillway with the reservoir full; is that it?

A. MS. KEYES: Can you please repeat the question?

Q. In the final analysis, Ms. Keyes, is it your recommendation that the director of dam safety, when he or she is having a look at this, that they ought to at least consider whether the routing analysis undertaken by Stantec should have started with a full reservoir; is that the bottom line?

A. MS. KEYES: Yes.

Q. All right.

MR. FITCH: One moment, Mr. Chairman.

THE CHAIR: Okay, sorry, took a couple of seconds to find the mute button.

MR. FITCH: Sorry, Mr. Chair, I just had to consult with Mr. Wood and Mr. Menninger.

Mr. Austin, Ms. Keyes, those are all our questions. Thank you very much.

A. MR. AUSTIN: Okay.

MR. FITCH: So I'm going to, then, move to my old friend, Mr. Dowsett.

How are you this morning, sir? Mr. Dowsett?

A. MR. DOWSETT: I'm here, just about -- I'm just trying to find the right buttons to push.

THE CHAIR: There we are. Perfect, thank you.

A. MR. DOWSETT: I'm very well, sir. It's nice to see you.

Q. MR. FITCH: Good to say you too.

So just to begin with some points hopefully just to clarify a few things.

So you corrected your evidence this morning, and I just want to sort of see if I can quickly summarize where we're at.

You have now, through your testimony on Friday and your correction this morning essentially withdrawn the concerns that you had expressed in your report regarding the emergency management system for SR1; is

that fair?

A. MR. DOWSETT: Yes, that is.

Q. Okay, thank you.

So the next point I'd like to try and clarify is, you stated Friday, and this is at page 1338 of the transcript -- but I don't think we need to turn it up because I'm sure you will remember -- you said quote: (as read)

"First, I would like to say I am not a member of SCLG."

End of quote. Do you remember that?

A. MR. DOWSETT: Yes.

Q. Okay. So I can tell you, we were a little surprised to hear you say that.

And the reason ism I'm going to ask the Zoom host to go to Exhibit 248, please, this should be Exhibit A to the written submissions of the SCLG, which is the membership list. So we'll just let that load up, Mr. Dowsett.

And I apologize, Mr. Chair, I don't think I notified the document manager that I would be referring to this.

So if we could just -- if we could just skim down a little bit farther, please. Okay, that's good.

So, Mr. Dowsett, we're looking -- I'm looking at

line 50 in this Excel spreadsheet, and I see your name.

Are you surprised to learn that SCLG thinks you're a member?

A. MR. DOWSETT: Yes, I am.

Q. Okay. Zoom host, can we go to Exhibit 247, please?

This should be the main submission or the group submission of SCLG. 247. And if we could turn to PDF page 11, please.

So, Mr. Dowsett, I'm looking at paragraph 36, and I think we can all now see it on the screen. So it states that: (as read)

"In addition to the technical report from AEL (that's Austin Engineering), some members of the SCLG with technical expertise on emergency response planning and emergency preparedness provided additional comments on these issues. See for example, the submissions of Ian Dowsett, which is attached as Appendix "I" to these submissions."

So, sir, I interpret this to mean that your lawyers thought that you were a member of the SCLG, but I guess that's not right, you're telling us?

A. MR. DOWSETT: Yeah, that would be correct. As I'd indicated, I think in previous testimony,

my wife is a very active member of the community and is -- takes on a lot of causes, and I was asked to attend an SCLG meeting to provide some advice. And I think you would be aware of this, I was looking for -- it's been extremely difficult sometimes for intervenors to find supportive and appropriate counsel and technical support. And I had indicated to them that I had talked to -- on their behalf, I did phone a few lawyers that I knew and some other counsel -- yeah.

And -- and then Ms. Hunter asked me if I would review the design document, which I did, and I was quite surprised to find -- see that some of the -- it struck me right away that there was quite a discrepancy between the amount of water that would be diverted and the amount that would be coming downstream, and so I indicated that to her, and I did review some of the stuff for her.

So, having said that, I am surprised because I did prepare a report, only near the end of this proceeding, which I found a little bit thin in itself, but just to support their view.

And I certainly am not a member -- I'm not submitting this on behalf -- I'm submitting this on behalf of safety, not on behalf of SCLG.

Q. You prepared a report to support the view of the SCLG;

is that right --

A. MR. DOWSETT: It was not to support the view of the SCLG. My report was to make some points with regard to safety, and I believe that that's the nature of the report I submitted, sir, and if you want to -- and the reason I'm on the first list is my wife signed me up.

Q. The truth comes out. All right. Fair enough, sir.

So Zoom host, can we go up say two pages, I'm looking for paragraph 11 of the SCLG submissions. Okay, that's good. So you have now -- no, no, there we go. Perfect. Thank you.

So, Mr. Dowsett, I think I now understand that you've said you are not a member of the SCLG.

So when I look at paragraph 11, this is the requested disposition advocated for by the SCLG, and that is that the Board deny AT's applications.

Is that your position, then, sir?

A. MR. DOWSETT: With respect to the materials that Ms. Hunter has provided and all of those -- the reasons that she has given, I think that's the view of the community.

In my view, I am just saying I -- I have no position. I have no -- I -- either way.

So I'm just -- my position, I want to ensure that

the fundamental principles of -- that we have applied safely over my life and so on are applied here.

Q. All right. Thank you.

So, sir, you've -- well, I was going to say you filed a CV, but, apparently, someone has filed a CV for you --

A. MR. DOWSETT: Well, I was asked to supply that in support of the materials.

Q. Sure.

A. MR. DOWSETT: Yeah.

Q. And Zoom host, we can take down the document. Thank you.

So we don't need to bring up your CV, but I think on Friday in your testimony, you indicated that you have worked extensively in safety, but you acknowledge you have no background in dam safety; correct?

A. MR. DOWSETT: That's correct.

Q. Yeah. Your background is in pipelines; correct?

A. MR. DOWSETT: Yeah.

Q. Yeah. And you worked -- as you said on Friday, you worked at the ERCB for 16 years; right?

A. MR. DOWSETT: That's correct.

Q. You became a consultant working at Conor Pacific and RWDI?

A. MR. DOWSETT: That's correct.

Q. And during that time, lawyers like Mr. Secord and I would retain you to carry out air dispersion modelling and to assess hazards and risks associated with uncontrolled releases from oil and gas infrastructure such as wells and pipelines; right?

A. MR. DOWSETT: Yes, that's correct.

And further -- I might add that, during that period, I was involved in numerous number of forensic reviews of accidents, and I think that's helpful in looking back at the kinds of data we need and timing of response, and that's -- those sorts of things, yes.

Q. And you have no expertise or experience in assessing the hazards of overland flooding, do you?

A. MR. DOWSETT: All I can say -- and my expertise is only what is published, and so I looked at the inundation maps prepared by AT in terms of converting those inundation maps to consequence, i.e., property damage or -- or loss of life, I would agree with you.

But, certainly, I think we can look at flood return rates and volumes and rates in the river and make some reasonable decisions. It's not rocket science.

Q. Okay. Now, one final point I'd like to clarify if I could, Mr. Dowsett.

Prior to your testimony Friday, your counsel

circulated a PowerPoint presentation, and while she was leading you through your direct evidence, she asked the document manager to pull it up. And you said, quote: (as read)

> "I don't believe I have one, so I would like to make a statement. There is no PowerPoint."

End of quote.

A. MR. DOWSETT: So --

Q. Do you recall -- just let me ask -- do you recall making that statement?

A. MR. DOWSETT: Yes.

Q. Yeah. So, in fact, of course, there was a PowerPoint as noted by your counsel. So I really am just curious, can you tell us, did you -- did you not write the PowerPoint presentation that had been circulated by your counsel or what was the issue there?

A. MR. DOWSETT: Sir, the materials I provided to counsel, they asked me to prepare a PowerPoint. I started working on it, sent in the draft, and that's where I thought it ended.

And I subsequently had said to them, please -- sent them an email saying that I don't think this is the right approach, and I did not want that material into evidence.

Q. Okay, thank you.

A. MR. DOWSETT: And further to that, sir, it's not as though we are -- this group and my discussions with them are -- are an orchestrated event. I mean, we're working independently at arm's length with no prep time and no ability to talk to one another on an input basis to talk about reports and making sure that our data all lines up.

So I think that it's only fair that we get a little latitude with respect to trying to getting stuff on the table that's meaningful.

Q. Okay. Mr. Dowsett, just turning now, we've -- you've said you no longer have concerns about the emergency management system part of your evidence --

A. MR. DOWSETT: Yes.

Q. So I just want to now explore with you the other part of your evidence very briefly, which is the hazard mapping.

And as I understand it, what you did is you looked at hazard mapping -- flood hazard mapping prepared by, I think, Golder Associates for the government of Alberta; is that right?

A. MR. DOWSETT: That's correct, yes.

Q. And you looked at that mapping, and you concluded that it shows a couple of things: Firstly, that in a 1 in

100-year flood, flows downstream of SR1, but upstream of the Glenmore Reservoir, would be equivalent, with SR1 in place, of approximately a 1 in 20-year flood. Do I have that right?

A. MR. DOWSETT: Not really, no.

Q. No? What did I get wrong?

A. MR. DOWSETT: So the approach that I took was to look at the upstream hydrographs and look at the peaks of those, and then look at the effect of the mitigation that you would achieve by diverting water into SR1, and look at the remaining flow that travelled downstream.

So the only floods, as the way I understand it, is that the return periods that we are most concerned with are those upstream of SR1. Those are the hydrographs we're dealing with.

And then what we want to do is look at, what is the reasonable level of water downstream.

So when we look at the downstream flows, we actually -- they're no longer return periods; they're just statements of the elevation of the water. The only return period of real concern to me is the one upstream.

So when we start looking at the levels downstream, how do we look at the inundation.

And that, sir, is -- so what I did is a three-step

process: Look upstream; model what happens in the middle with respect to flows, using a very simple approach, you know, rate times time is volume and look at the volumes that get diverted and the volumes that travel downstream; and then look at what happens at Glenmore and below Glenmore. And, you know, those things line up with what -- what Stantec has said.

It's just that I was concerned about the levels of water that pass SR1.

And when we look at a 1 in 100-year frequency upstream or a 1 in 200-year, which was the design frequency, we end up with floodwaters in that midsection which are equivalent, not in -- not in return periods, but in peak -- to a 1 in 20- and a 1 in 50-year flood.

Then I simply took the AEP, and these -- so I had used the AEP return frequency and peak flood because the other -- because they have directly relatable inundation maps associated with them, and they -- these points and their peaks do not line up with the ones provided by Stantec.

Now, reasonably, they're close, but I went to the AEP ones because I was able to then look at the inundation maps. Does that make sense?

Q. Well, it was a very long answer, but I think I

understand it, and -- and I thought I had used the word "equivalent." I wasn't suggesting that it was actual recurrence period.

But I think, in the midst of that answer, you did confirm that -- you had said in your report, essentially, that with SR1 in place in a 1 in 100-year flood, there will be inundation downstream of the -- downstream of the dam but upstream of the Glenmore Reservoir equivalent to a 1 in 20-year flood. And in the case of a design flood, that is the 1 in 200, you're saying that when you looked at those hazard maps, what you saw is that they show that the flooding downstream of SR1 but upstream of the Glenmore Reservoir will be equivalent to a 1 in 50-year flood. That's all I was trying to have you confirm, and I think you have confirmed that; right?

A. MR. DOWSETT: Yes, I have, yeah.

Q. Okay. And I sent your counsel a couple of aids to cross-examination last night. Have you had a chance to look at them?

A. MR. DOWSETT: No, sir, I have not. No, no.

Q. You have not?

A. MR. DOWSETT: No.

Q. Did your counsel not provide them to you?

A. MR. DOWSETT: I have no idea. I -- you know, I

have some issues. I -- I do not -- I needed some sleep, and I got it.

Q. Fair enough. Well, let me just try a few questions on you without bringing up the aids to cross, and I'll just see if you agree.

MR. SECORD: Mr. Fitch, when did you send them to us yesterday --

COURT REPORTER: I can't -- I can't hear Mr. --

THE CHAIR: Mr. Secord, we need you to speak up because we can't hear you very well and neither can the court reporter.

MR. SECORD: How does this sound? Can you hear me?

THE CHAIR: A little better, not much.

MR. SECORD: Can you hear me now?

THE CHAIR: Is it coming through your laptop or headphones, I'm not sure, Mr. Secord, but --

MR. SECORD: I'll get my tech person over shortly.

But, Mr. Fitch, when did you send those aids to cross to us?

MR. FITCH: They were sent at around 5-ish yesterday afternoon. Maybe I did what Ms. Okoye did and somehow forgot to copy you; I don't think so, but.

MR. SECORD: I'm sure I forwarded them to

Mr. Dowsett. So if they came in after 5, he would have -- I probably got them off to him around 6:00 p.m., but he may not have seen them. He was having Sunday dinner and --

MR. FITCH: Sure.

MR. SECORD: -- going to bed early.

MR. FITCH: Well, that's why I asked. Okay.

Q. So let me just -- let me just run a few things by you, Mr. Dowsett, and see what you have to say.

Would you agree that in Alberta, the provincial government defines the flood hazard area as being the area of land that will be flooded during a 1 in 100-year flood; are you aware of that?

A. MR. DOWSETT: No, but it sounds reasonable to me.

Q. Okay. And are you aware of the various definitions of floodway and flood fringe?

A. MR. DOWSETT: Not at all, no.

Q. Are you aware that the government of Alberta basically discourages development in a 1 to 100-year flood hazard area?

A. MR. DOWSETT: I would certainly hope so, yes. I wasn't aware of it, but I would hope so.

Q. And are you aware that Rocky View County as indeed I think all municipal districts and counties in Alberta

have incorporated these concepts into their land use bylaw?

A. MR. DOWSETT: Other than the material that you had sent out, I don't know when I saw it, but I did see a Rocky View MD requirement, and -- and what the timing of that requirement was, I think you'd have to check with others.

Q. Would you agree with me that essentially under the Rocky View County land use bylaw, development within the floodway is generally prohibited?

A. MR. DOWSETT: I would say -- I would say that makes common sense, in the same way that, you know, development within a sour gas region, around a sour gas zone, and a certain level of safety, i.e., as defined by risk would be suggested that it would be prohibited.

Q. And are you aware that the Rocky View County bylaw basically says that if you want to develop within the flood fringe, which is the portion of the flood hazard area outside the floodway, so the water's not flowing so deep and so fast, that if you want to develop in the flood fringe, it may be permitted, but you have to take steps to essentially flood proof your development, are you aware of that?

A. MR. DOWSETT: Again, sir, I am not aware of that.

Q. So let me put the following proposition to you, sir, and see if you agree with this.

By reducing flows downstream of SR1 and upstream of Glenmore Reservoir in the design flood scenario, 1 in 200 years, by reducing those flows to approximately 1 in 50, SR1 has the effect of lessening flows and restricting them to the area within which you're not supposed to develop, would you agree with that?

A. MR. DOWSETT: As much as -- well, just run that by me one more time, please. I just want to make sure I understand.

Q. Sure. So we've agreed that one of the things you say in your report is that the effect of SR1 in the case of a design flood, or a 1 in 200-year flood, is that flows downstream of SR1 but upstream of Glenmore Reservoir will be equivalent to an approximate 1 in 50-year flood; right? We've agreed on that?

A. MR. DOWSETT: Yes, yes.

Q. Okay. So given that the Rocky View County land use bylaw essentially prohibits or certainly restricts development within the 1 and 100-year flood hazard area, do you agree with me that the effect of SR1 is to limit flow downstream of the dam and upstream of Glenmore Reservoir to those areas where you're basically not supposed to develop?

A. MR. DOWSETT: **So, in response to that, I would say, yeah, that -- yes, I would agree. But I have no idea at all when those homes went in, just -- just one moment, sir.**

Q. Sure.

A. MR. DOWSETT: **Sir, I think the -- I'm being asked to caucus.**

Q. Sorry, don't ask me how you do that?

A. MR. DOWSETT: **I have no idea.**

THE CHAIR: Mr. Secord, is there a request in, or Ms. Okoye?

MS. OKOYE: Yes, there's actually a meeting room for them. I'm not sure who is asking him for -- to caucus, probably one of the panel members. Perhaps maybe he could be put into the room, if that's possible. I'm not sure how he can do that.

A. MR. DOWSETT: **Well, I'm not sure either, but I would say, you know, just in terms -- I think maybe we just proceed here and just mention that while we would agree, I have no idea --**

MR. SECORD: Yeah, Mr. Dowsett, there should be a button that shows up which says "Accept" on your screen. It should be accept to go into a meeting room.

A. MR. DOWSETT: **I see nothing.**

MR. FITCH: And I'm sure, Mr. Chairman, this

is obvious, but Mr. Dowsett, of course, is entitled to caucus with the other members of the witness panel but not with anyone else.

A. MR. DOWSETT: Yeah.

Q. MR. FITCH: Right.

MS. OKOYE: That's actually true; the meeting room is set up for just the witness panel members, not --

MR. SECORD: Mr. Chair, could we take a brief break so we can get Mr. Dowsett moved into the meeting room?

THE CHAIR: And it may be on your screen, it may not be a pop-up, but if you move your cursor and at the bottom where you have "Mute" and "Start Video" and "Participants," there's one of those buttons if it is set up on Mr. Dowsett's --

A. MR. DOWSETT: Oh, breakout room. Here we are.

THE CHAIR: Right, right. There you go.

A. MR. DOWSETT: Thank you, sir.

THE CHAIR: So you need -- just -- you need a couple minutes, Ms. Okoye?

MS. OKOYE: Yes, please.

THE CHAIR: Just take a couple minutes.

MR. SECORD: Click on that button, Mr. Dowsett. Is my sound a bit better now, sir?

Ms. DiPaolo, can you hear me better?

THE CHAIR: Yeah, it's not bad. Yes, thank you, Mr. Secord.

MR. SECORD: Yeah, I think I had my volume turned down.

THE CHAIR: So you may want to check. We didn't -- hopefully Mr. Dowsett knows how to return without cutting his Zoom off. There's two buttons there. One will get you out totally, and one will get you back to the main room.

MR. SECORD: I think this is a new venture for our panel. I don't think we've ever had a hearing where we've had to caucus, so.

THE CHAIR: Right. Right.

MR. SECORD: This is new, sir.

THE CHAIR: No, fair enough. Let's make it work.

Are you all good?

MR. KENNEDY: Mr. Chair, I see Mr. Dowsett is back in the hearing room.

THE CHAIR: Thank you, Mr. Kennedy.

Mr. Dowsett, it all worked perfect. So everybody's ready to go? Counsel's ready?

Q. MR. FITCH: Yes.

Go ahead, Mr. Dowsett.

A. MR. DOWSETT: Well, that was an interesting experience.

So where were we? Can you refresh me?

Q. Well, you know, I had the answer to my question, so you were the one who wanted to caucus. You tell me where we are. I had -- I have no further questions for you.

A. MR. DOWSETT: Oh, well I -- I would just -- I would like to clarify a couple of issues with respect to the return periods.

The return periods that I gave you on the basis of diversion of 600 cubic metres per second, if the operator were to change those, these numbers would come up. And I think that it's clear to me whether Rocky View has -- whatever the timing of those -- of their requirements for flood control, which I think would be an extremely good idea going forward from my perspective, that I have no idea whether those flows exist.

The ones I'm concerned about are those directly below the foot of the dam that are below the emergency spillway, and I'm worried about those people and what they knew and what they understood the hazard was and what operational decisions may be taken by the operator that would increase the rates coming down this river and raising numbers even higher.

And I think -- and I think you and I and others have been of the opinion that, when it comes to individual rights, that those should be discussions that are had with landowners that tell them what the hazard really is and what potential changes in that hazard are and what the emergency planning measures would be, and give them an opportunity to look at options that they would agree to with respect to whether this is fair or unfair.

Having said that, sir, that's all -- that was the entirety of the basis of my report, and I hope that it's -- that I've cleared that up.

MR. FITCH: Thank you.

Mr. Chair, I believe I'm done with Mr. Dowsett and the Austin Engineering witnesses, and we're not cross-examining Mr. Klepacki or Mr. Fennell, if he's still on this panel, until the next topic session. So I think we are done.

I would ask, however, if you would grant me the indulgence of just a couple minutes to confer with our client.

THE CHAIR: Yes, please do.

MR. FITCH: Thank you.

Mr. Chairman.

THE CHAIR: Yes.

MR. FITCH: I can confirm that that concludes Alberta Transportation's cross-examination of the SCLG witness panel in this topic session. Thank you very much to the witnesses.

THE CHAIR: Thank you. Thank you, panel members.

Mr. Fitch just to clarify, Mr. Fennell will be in Topic 4, the next topic area.

MR. FITCH: Correct.

THE CHAIR: You had questions for him in Topic 4, but were some of the questions from Topic 3 actually being carried to him individually in Topic 4 or not?

MR. FITCH: Yeah. So I -- the way -- I think where we left things was we -- I think I indicated Friday that we would be putting over to Topic Session 4 our questions for -- is it Dr. -- Dr. Fennell. And actually over the weekend, my friend, Mr. Secord, circulated a revised form of presentation for Dr. Fennell which essentially combines his Topic 3 and Topic 4. So it's all now in Topic 4. That's my understanding. And the same with Mr. Klepacki or Dr. Klepacki.

THE CHAIR: Okay, thank you.

MR. FITCH: Yeah, thank you.

THE CHAIR: So we'll move to Board staff and Panel questions for the panel on Topic 3.

Mr. Kennedy?

MR. KENNEDY: I have no questions for Austin Engineering or Mr. Dowsett.

THE CHAIR: Ms. Vance?

MS. VANCE: I have no questions either.

THE CHAIR: Mr. Ceroici?

MR. CEROICI: And I have no questions either. Thank you.

THE CHAIR: Dr. Heaney?

MR. HEANEY: I have no questions for these witnesses.

THE CHAIR: Ms. Roberts?

MS. ROBERTS: I have no questions either. Thank you.

THE CHAIR: And I have no questions. So thank you very much panel members. We can --

MS. OKOYE: Mr. Chair, I do have some redirect.

THE CHAIR: Oh, I'm sorry, I'm sorry.

MS. OKOYE: That's always a forgotten step.

THE CHAIR: Well, not always, but, you're right, I have done it a few times so thanks for the reminder.

MS. OKOYE: No problem. My redirect will go to Mr. Dowsett.

MS. OKOYE RE-EXAMINES THE PANEL:

Q. So, Mr. Dowsett, you and Mr. Fitch were discussing the Rocky View County development bylaw. Do you recall that?

A. MR. DOWSETT: Yes, I do.

Q. Do you know when the development -- that Rocky View bylaw was created?

A. MR. DOWSETT: No, I have no idea. It's the -- the first time I'd seen it was in an email that was attached, I don't even remember the date. But as soon as I saw it, I had -- I mean I -- I have -- I did not see that in the past.

Q. Okay. And you don't recall if that would have been January 2021?

A. MR. DOWSETT: No, I have no idea.

Q. Okay, so just a few things. Can you confirm that you do not work for the development planning department for the Rocky View County?

A. MR. DOWSETT: Yes, I confirm.

Q. And also --

A. MR. DOWSETT: Yes, I confirm.

Q. And also, you're not a development planner?

A. MR. DOWSETT: No, but I've -- I've subdivided my

property, and I've gone through the horrible process, so...

Q. Okay, that's fine. And so your views that you had expressed regarding the land use bylaw were just your personal views and not based on Rocky View's interpretation of the bylaws; is that correct?

A. MR. DOWSETT: Which bylaw is that that you're speaking of?

Q. The one that you discussed with Mr. Fitch.

A. MR. DOWSETT: On the flood control?

Q. No, no, the Rocky View development -- yes, that he talked about the flood hazard areas and flooding areas --

A. MR. DOWSETT: No.

Q. So are those your personal views? They're not based on the Rocky View County's views?

A. MR. DOWSETT: I -- I mean, it's the first I've seen that particular piece of paper, and I believe that, going forward into the future, that if this is a new bylaw, then it seems to me that that would make sense on a go-forward basis. Retroactively, I have no idea whether that was the case.

I also think that when you look at this bylaw, you know, consideration -- I'm not sure if it has room for consideration of climate change, you know, it's sort of

out of my area. But if -- if -- if these numbers that are using for flood now change in the future, that bylaw itself could be revised again.

But it could mean that people who are currently building following that guidance may not -- may be at risk later. But I think in general, I would support the idea that that bylaw should be there; it's just whether -- what the timing is on it and how it applies in this situation.

Q. Okay, thank you. That would be all, Mr. Chair.

Thank you, Mr. Dowsett.

THE CHAIR: Thank you, Ms. Okoye.

Okay. With that, we could move onto direct on Topic 3. Mr. Williams with Calalta. Mr. Williams?

I believe Ms. Friend may have received a note that he may not be providing direct. I just want to confirm, though.

Is Mr. Williams online?

MR. KENNEDY: Mr. Chair, I can advise that in canvassing the parties prior to the hearing, Calalta advised that they had no direct evidence for Topic 3).

THE CHAIR: Perfect. Thank you.

Mr. Wagner did indicate he may have direct.

Mr. Wagner, did you have direct on Topic 3?

MR. WAGNER: Morning, Mr. Chair. Yes, I do.

And I may I ask for the indulgence of the Panel, I would like to have a little bit longer. That is, probably about ten minutes.

THE CHAIR: That is not a problem, Mr. Wagner. Please proceed.

MR. WAGNER: Thank you. I'm going to turn off my video with that's okay with the Chair --

THE CHAIR: Yes --

MR. WAGNER: -- because I've got limited bandwidth?

THE CHAIR: Yeah, that's fine. I think it freezes anyway, Mr. Wagner.

S. WAGNER (Spokesperson), previously sworn

A. Could I get the document manager to bring up Document 371? Should be a PowerPoint presentation. And can you move down to Slide Number 10, please? And go to the next slide, please.

The GoA refers to regulations and hunting already taking place within the SR1 as a solution to our safety concerns.

In my humble opinion, the GoA is not considering the seriousness of the situation, nor any of the unique issues associated with the placement of our house and access road.

We built our house in 2000 and placed it at the geographic centre of our property. I can assure the NRCB, this would be one of the last places I would build a house knowing the SR1 location.

Our property is one of the closest rifle hunting zones to Calgary with elk herds that can be spotted from the highway, and we lose our current protections if SR1 is approved.

Unfettered hunting terrifies me. Hunting regulations allow for high-powered rifles to be discharged within 200-metre -- at 200 metres from a house, and as the chart states, bullets are lethal within kilometres.

Furthermore, regulations on how to point a rifle are not entirely helpful to our situation. Common sense and rifle safety states that rifles should not be pointed at our house, our yard, our driveway, or at individuals walking on the property. However, any hunter I have led onto our property to hunt elk or deer gets location training. We lose this ability under public access within SR1.

"Occupied Lands," which is a definition used in hunting regulations, provides additional protections for house owners on private property, but is not applicable to public lands which will be the GoA's

designation for SR1.

As for protecting our safety, would you approach a complete stranger with rifle in hand to warn them of potential risks? I'm not quite that brave a person.

Oh, and public lands are on our front lawn.

Our access road to our house is within the legal discharge zone for high-powered rifles. We, or any visitor, or weekend walker out for a stroll, would need to depend on a hunter with a scope on prey to see a vehicle or walker which may be masked by 10 feet of willow. Walking, cattle ranching, or even mowing the lawn will be significantly affected. There's a logical assumption that something bad will occur.

I have no -- I find no regulation on the distance of bow hunting discharges. So bow hunting is allowed on our front lawn.

The unique nature of elk herds, proximity to Highway Number 22, proximity to Calgary, rifle hunting zone, private road within the rifle discharge zone, houses within metres of public lands, public hiking, and lack of monitoring, will increase the risk far above other locations within the province. I believe hunting and SR1 are not compatible.

I am no less concerned about fire control brought on by casual smoking in knee-high grass. Just can't

get the thought of a barrel of the rifle in my mind.

Next slide, please. I'm sorry, I didn't see a slide change. Okay, thank you.

This was the bow hunting area with the regulations.

Can I get two slides down, please? One more?

So I can confirm that we've come to resolution with the GoA on remediation on the first Indigenous dig. This happened in the past three weeks.

However, all of the concerns that I've raised in my submission with regards to this dig are still valid. I believe that greater oversight over contractors would be beneficial.

While getting the Indigenous site reclamation organized, it came to my attention that we were never contacted by pipeline companies, nor utilities, re-staking underground assets and, furthermore, no residual flags exist near the site.

Since the dig, the one shown on the slide here, is very close to a nasty condensate pipeline, it is concerning. "Call before you dig" is normal procedure, and I would have expected this to be arranged by Stantec. I do hope the additional Indigenous study locations go better.

As for the causeway that I submitted in my

submission, I wish I could say I'm an engineer, but I'm not. However, I have been an executive responsible for building large roofs and wind turbines.

The causeway looks like a large version of both to me. Over the years, I also have driven by numerous truck rollovers on Highway 22 near our property and at the causeway location.

To the GoA's credit, they've been improving the off ramp from Highway Number 1 to Number 22 just north of the causeway in an attempt to improve rollover issues.

The GoA did not respond to my comments on wind on the causeway, did not dismiss the issue, nor acknowledge such. I do believe that the causeway has a long-term potential wind problem, and hope that the GoA has a solution. We don't need more truck rollovers.

Lastly, after listening to a number of discussions over the last number of days, I was curious about riprap on the dam and the effects of wind and waves.

If I were a resident downstream of SR1, I certainly would sleep more soundly if there was riprap on at least the top portion of the SR1 dam.

I wrote this comment yesterday when the wind was howling and the wind warnings were 100 kilometres per hour.

Thank you, Panel, for your time. I'm available for cross.

THE CHAIR: Thank you, Mr. Wagner. I think we have some feedback going on -- is that corrected? Thank you.

Ms. DiPaolo, can you hear me okay?

Okay. Thank you.

MR. KENNEDY: Mr. Chair, I'm wondering if we might enter this PowerPoint as an exhibit. I don't think it's been entered previously.

MS. FRIEND: This is Laura. Actually, it has been. It's Number 371.

MR. KENNEDY: Thank you.

THE CHAIR: 371. Okay, thank you, Mr. Kennedy.

Ms. Louden or Mr. Rae?

MR. RAE: We have no questions, sir.

THE CHAIR: Thank you. Ms. Okoye or Mr. Secord, I would assume no questions?

MR. SECORD: No questions, sir. Thank you.

THE CHAIR: Thank you.

City of Calgary? Ms. Senek? Or Ms. Munkittrick perhaps?

MS. SENEK: Sorry, Melissa Senek here. Just looking for my mute button.

We don't have any questions. Thank you.

THE CHAIR: Thank you.

And Mr. Cusano?

MR. CUSANO: No questions, sir. Thank you.

THE CHAIR: Mr. Fitch?

MR. FITCH: Thank you, Mr. Chair. Just a couple.

MR. FITCH CROSS-EXAMINES THE WITNESS:

Q. Good morning, Mr. Wagner.

A. Good morning, Gavin.

Q. Sir, do you understand that the rules that would apply to hunting in the project have not yet been prepared or finalized?

A. I was not aware of that; however, what has been communicated to this point was that standard hunting regulations would apply, and we are also aware that they may even be slightly expanded.

Q. Mr. Wagner, I take it, given the concerns you've expressed about hunting, that you would like to be included in any consultations on the rules that will apply to hunting in the project area when that consultation occurs?

A. Absolutely. However, having said that, the only times that we've really had a serious discussion about this with the GoA are on a couple different occasions, but

the primary ones were at the public events, and I have to say that they were not, I wouldn't say, accepted.

Q. Okay. And I think you've already alluded to this, but you would acknowledge that any hunting that ultimately does occur in the project area would have to comply with all existing laws and regulations?

A. As I've stated in my submission or my talk this morning, I recognize that; however, the unique circumstances of location and the increased access really increase the risk, Gavin.

Q. Okay. Mr. Chair, I think those are all my questions for Mr. Wagner.

Again, I'm just going to quickly consult with my client, if you give me one moment?

THE CHAIR: Yes.

MR. FITCH: Thank you.

Mr. Chairman, those are our questions for Mr. Wagner. Mr. Wagner, thank you again.

MR. WAGNER: Thank you, Gavin.

THE CHAIR: Mr. Wagner, thank you.

And Board staff, Mr. Kennedy, Ms. Vance, any questions? Mr. Kennedy?

MR. KENNEDY: Mr. Chair, I have no questions of Mr. Wagner.

MS. VANCE: Nor do I, sir. Thank you.

THE CHAIR: Thank you. Ms. Roberts?

MS. ROBERTS: Yes.

MS. ROBERTS QUESTIONS THE WITNESS:

Q. Mr. Wagner, just one question.

In addition to hunting, you several times have expressed fire as being a concern that you have, and particularly if this becomes -- if this is approved and if it becomes public land where the public can traverse, and you had commented, I believe, on, you know, somebody just flicking a cigarette butt, and so on, in the area.

Do you have any suggestions for -- if this is the case, if it's approved, if this becomes an area where the public can go, how that could possibly be dealt with?

A. My biggest concern was, with regards to fire department access the lands, it is my understanding, and I might be wrong, but fire departments in Bragg Creek have a policy of not going into the field, and that limits the ability of -- well, it increases the chance of a major fire because fires can be doused a lot quicker when they're smaller. So that's one. I've already made that suggestion to the GoA, and I believe they've taken that as an undertaking.

The second aspect, they have talked about grazing,

and I would highly recommend that grazing continue on the property.

The third aspect, I asked about cutting down the to potential bush and trees after a major flood. I'm not convinced that the GoA's comment about dead trees or them surviving a flood is -- is valid. So that would help with that situation, as well.

And, thirdly, I don't know how you stop weekend smokers. You know, you put up signs, you know, and -- you know, the law is the law, but the reality of the situation is that most of the fires along the highways, my understanding, is that it's usually, you know, smokers throwing butts out the window, stuff like that, and just the weekend walkers. I don't know how to handle that, other than you put up signs "No Smoking."

Q. All right. Thank you.

A. Thank you, Ms. Roberts.

THE CHAIR: Mr. Ceroici?

MR. CEROICI: I have no questions for Mr. Wagner, thank you.

THE CHAIR: Dr. Heaney?

MR. HEANEY: I have no questions, thank you.

THE CHAIR: I have no questions of Mr. Wagner. Did you have any redirect?

MR. WAGNER: I do not, Mr. Chair.

THE CHAIR: Well, thank you, Mr. Wagner.
MR. WAGNER: Thank you.
THE CHAIR: Just before the break, I'd ask I guess Mr. Fitch with Transportation, do you have rebuttal evidence on this topic?
MR. FITCH: We do not.
THE CHAIR: You do not.

So this closes this topic area, then.

We'll take a break and then start in on Topic Area 4, a broad area of just "Water" with Alberta Transportation.

Mr. Fitch, your Panel's ready for direct?

MR. FITCH: They are. We will need a few minutes to get everything organized. So this is a perfect for us for morning break.
THE CHAIR: Perfect. I'm thinking 10:15, does that -- will that work for you to get organized?
MR. FITCH: That does. Thank you.
THE CHAIR: Thank you. So we'll break till 10:15. Thank you, everyone.
(ADJOURNMENT)
THE CHAIR: I'll just confirm -- oh, sorry, I was just going to confirm with Mr. Fitch if the panel is ready and you're ready to begin.
MR. FITCH: The panel is ready, but I'm not

leading this panel; our colleague Mr. Barbero is.

THE CHAIR: Oh, okay, okay, Mr. Barbero, sorry. My apologies, and the floor is yours, Mr. Barbero.

MR. BARBERO: Mr. Chair, good morning, sir, NRCB Panel, counsel and staff.

As Mr. Fitch said, my name is Michael Barbero and, along with Mr. Kruhlak and Fitch, one of the lawyers acting for Alberta Transportation.

Sir, I'll be introducing Alberta Transportation's panel for Topic 4, water.

As with the prior panel, sir, I will have the witnesses sworn or affirmed. I'll introduce each witness and have them speak to their involvement. And following that, sir, Mr. Hebert and Mr. Brescia will deliver some opening remarks, after which the panel will be available for cross-examination.

Sir, I'd like to start, though, by having those members of what we have been referring to as the "common panel" just confirm on the record that they remain under oath from last week, sir, if that's an agreeable approach?

Sorry, I see you nodding your head, so I'll take it --

THE CHAIR: I was just running for my mute

button, sorry. Yes, please proceed.

MR. BARBERO: Very good, sir. Thank you.

Q. Mr. Hebert, sir, are you there?

A. MR. HEBERT: Yes, I am.

Q. Sir, can you please acknowledge that you are still under oath?

A. MR. HEBERT: Yes, I am.

Q. Thank you, sir.

Mr. Speller, can you please acknowledge that you are still under oath?

A. MR. SPELLER: Good morning. Yes, I am.

Q. Mr. Brescia, can you acknowledge that you are still under oath?

A. MR. BRESCIA: Yes, I am.

Q. Mr. Wood, can you acknowledge you are still under oath?

A. MR. WOOD: Yes, I am.

Q. Mr. Svenson, can you acknowledge that you are still under oath?

A. MR. SVENSON: Yes, I am.

Q. Thank you.

MR. BARBERO: I'd also like to note, Mr. Chair, that we've brought back Mr. Menninger, Mr. Back, and Dr. Luzi for this panel. While not members of the common panel, we are bringing them back given last week's discussion and agreement to move certain matters

pertaining to climate change into Topic 4.

So sir, at this time I would confirm with each of those witnesses that they also remain under oath, starting with Mr. Menninger.

Q. Mr. Menninger, sir, are you there?

A. MR. MENNINGER: I am.

Q. Sir, can you acknowledge that you are still under oath?

A. MR. MENNINGER: Yes, I am.

Q. Mr. Dan Back, sir, are you there?

A. MR. BACK: I am.

Q. Mr. Back, can you acknowledge that you are still under oath?

A. MR. BACK: Yes.

Q. Dr. Luzi, sir, are you still there?

A. MR. LUZI: I am.

Q. Sir, can you acknowledge that you are still under oath?

A. MR. LUZI: Yes, I am.

Q. And, Mr. Yoshisaka, can you acknowledge, sir, that you are still under oath?

A. MR. YOSHISAKA: Yes, I am.

Q. Thank you, sir.

With that, I would ask that Madam Court Reporter please proceed to have the new witnesses sworn or affirmed as per their preference.

(DISCUSSION OFF THE RECORD)

M. HEBERT, M. SVENSON, W. SPELLER, D. BRESCIA, M. WOOD, J. MENNINGER, D. BACK, D. LUZI, D. YOSHISAKA, D. JOBSON, L. AUCOIN, T. NOBLE (For Alberta Transportation), previously sworn/affirmed and sworn/affirmed

MR. BARBERO EXAMINES THE PANEL:

MR. BARBERO: Thank you, Madam Court Reporter.

Q. Mr. Jobson, sir, may I start with you, please?

A. MR. JOBSON: Yes.

Q. Sir, you can confirm that your CV has been filed as part of Exhibit 336 at PDF page 15; is that correct?

A. MR. JOBSON: Yes.

Q. And sir, you can confirm that you work at Matrix Solutions as a senior aquatic biologist?

A. MR. JOBSON: I work at Matrix Solutions as a senior aquatic biologist from May 2019 to January 2021. I was a senior associate aquatic biologist at Stantec. From April 2016 to May 2019, I was an independent consultant.

Q. Thank you, sir.

MR. BARBERO: Madam Court Reporter, I had some audio trouble. I don't know if you did as well.

COURT REPORTER: Umm-hmm.

Q. MR. BARBERO: Mr. Jobson, sir, if you're able to move closer to your mic perhaps. Thank you.

Sir, what is your education or experience in the area of aquatic biology?

A. **MR. JOBSON: I received a bachelor of science in biology from the University of New Mexico in 1987 and a master of science in biology from Wichita State University in 1999.**

I am a registered professional biologist in Alberta and British Columbia. I have over 22 years experience working as an aquatic biologist in Canada and the United States working on variously sized aquatic environmental projects for assessment, monitoring, and regulatory purposes.

I have served in many different project roles, including technical lead, component manager, and qualified aquatic environmental specialist.

My technical background includes water quality and fishery science, and my experience includes aquatic effects assessments, investigating how changes in water quality and habitat impact by aquatic environments such as lakes, rivers, streams, and wetlands.

I have worked on more than 20 large and small environmental impact assessments, including water resource projects. This includes environmental assessment, mitigation planning, and regulatory support for flood protection and mitigation projects.

Q. Thank you, sir. And with regards to this application, what has your role or involvement in preparing reports or responses been to date?

A. MR. JOBSON: I was the water quality discipline lead for the application. I prepared information responses and updated assessments where new information became available.

Q. Thank you, sir.

Ms. AuCoin, are you there?

A. MS. AUCOIN: Yes, I am here.

Q. Good morning.

A. MS. AUCOIN: Morning.

Q. Can you confirm for me that your CV has been filed as part of Exhibit 336 at PDF page 48?

A. MS. AUCOIN: Yes, confirmed.

Q. Can you confirm for me that you work at Stantec as a fisheries biologist?

A. MS. AUCOIN: Yes, I do.

Q. And, ma'am, what is your education and relative experience?

A. MS. AUCOIN: I completed a bachelor of science with honours in biology in 2008 and a master of science in biology in 2011. Both degrees were obtained from Dalhousie University.

I have 12 years of experience as a fisheries

biologist. My employment history includes 10 years of consulting and two years as a research assistant.

In my time as a consultant, I've primarily worked as a fisheries biologist and regulatory specialist on river engineering projects.

I have experience with fish habitat assessments, fish habitat offsetting, and the development of mitigation plans for construction in rivers.

Q. Thank you. And with regards to this application, what has your role been, and have you been involved in the preparation of any report or responses to information requests?

A. MS. AUCOIN: Yes, I am the fisheries lead for the environmental impact assessment for this project. I have been involved in fieldwork, the preparation of reports, monitoring plans and responses to SIRs.

I've collaborated with the engineering team and other technical experts for our evaluations and reports, and I have presented some of our monitoring plans to Indigenous groups.

Q. Thank you. Ms. AuCoin.

Ms. Noble, are you there?

A. MS. NOBLE: Yes, I am.

Q. Good morning. I don't see you. Oh, there you are. Good morning.

Can you confirm that your CV has been filed as Exhibit 336, page 84 in this proceeding?

A. **MS. NOBLE: Yes, I can.**

Q. And, ma'am, can you confirm that you work at Stantec as a senior principal and senior risk assessment specialist?

A. **MS. NOBLE: Yes.**

Q. And can you please describe your relevant education and experience in this field?

A. **MS. NOBLE: I completed a bachelor of science in engineering from the University of New Brunswick in 1994, as well as a masters of engineering at the University New Brunswick in 2004.**

Since 1997, my professional experience has been primarily in the fields of human health and ecological risk assessment and water resources; assessed a wide range of contaminants at sites across Canada as well as the United States. And I've supported human health risk assessment components of multiple and environmental impact assessments since 2003.

Q. Thank you. And with regards to this application, what has your role been, and have you had any involvement in the preparation of reports or responses to information requests?

A. **MS. NOBLE: Yes. I have been involved in the**

health assessment since 2014, providing senior technical support and quality review at both the human health risk assessment and the public health sections of the EIS.

I've been responsible for authoring human health-related supplemental information request responses, as well as the hearing submissions.

Q. Thank you, ma'am.

MR. BARBERO: Mr. Chair, at this time, I would invite Mr. Hebert and Mr. Brescia to provide an opening statement with respect to Topic 4, water. I can advise that this statement has been provided in advance to all counsel and the Board and is Exhibit 374.

Mr. Hebert, sir.

A. MR. HEBERT: Thank you, Mr. Barbero.

Good morning, Mr. Chairman, members of the Board, members of other parties, and members of the public joining us today on YouTube.

Alberta Transportation, through its assessment of the environmental effects of the SR1 project and through consultation with various Indigenous groups, local landowners, and regulators, is keenly aware of the concerns raised with regards to potential impacts to water and related disciplines as a result of the project.

On behalf of Transportation, I have personally heard from and spoken with many Indigenous groups and landowners who have voiced concerns about whether the project may impact fish at aquatic habitat, water quality on local wells or alter water quantity at naturally occurring springs and other sources.

As will be discussed by Mr. Brescia in a moment, Transportation's analysis and detailed consideration of the issues associated with water quality and quantity, fish and aquatic habitat has culminated in Transportation having confidence that the project's impacts can be monitored for and, as needed, mitigated.

Since the next two topics focus on environmental impacts and mitigation, it is important to outline the approach taken by Transportation in the assessment of SR1.

The environmental assessment process addresses both project-related and cumulative environmental effects and follows a standardized framework for each valued component. That process involves a number of steps: First, scoping the assessment; second, characterizing existing conditions including the influence of past and current activities; third, assessment of residual project effects including the consideration of potential effects pathways in

applicable mitigation measures; fourth, assessment of cumulative effects; fifth, determination of significance; and, finally, identification of monitoring programs.

In addition to the above, Transportation's environmental assessment process includes engagement with stakeholders and Indigenous groups to inform the development of mitigation and monitoring plans. This includes a commitment to a community liaison to ensure that impacts felt by the community can be raised and dealt with by Transportation or Environment and Parks through the life of the project.

Specifically, Transportation has committed to water quality monitoring in the form of a draft surface water monitoring plan and groundwater monitoring plan.

Transportation is currently in the process of obtaining further approvals from Fisheries and Oceans Canada for potential impacts to fish and aquatic habitat, which will include offsetting and monitoring activities.

Further, Transportation has developed a draft fish rescue and fish health monitoring and mitigation program.

It is expected that additional engagement with Indigenous groups, regulators, landowners, and other

stakeholders will serve to further refine and clarify the scope and processes envisioned by these monitoring plans. To this end, we note that Transportation responded to the concerns identified most recently by various interveners in this proceeding.

Our consideration in responses are found in the reply submission and appended technical memoranda.

I would now like to invite David Brescia from Stantec to provide additional comment.

A. MR. BRESCIA: Good morning, Mr. Chairman.

As you know, my name is Dave Brescia. I'm an environmental and regulatory advisor with Stantec, and I have been actively involved with this project on behalf of Alberta Transportation since 2016.

As noted by Mr. Hebert, Alberta Transportation is keenly aware of the importance of understanding and addressing any impacts to water associated with the project, as water concerns may have implications for fish, local Indigenous groups, local residents, and downstream users such as the city of Calgary.

Consequently, at the direction of Alberta Transportation, Stantec undertook a comprehensive consideration of all aspects of project-related water concerns. These considerations started with the preparation of the EIA and then carried forward

throughout the regulatory process and engagement phases. It is work that continues.

As can be seen from a review of this material, multiple subject matter experts were engaged to investigate all aspects of the project interaction with water. Specifically, analysis was undertaken for the following disciplines:

Hydrogeology, or the movement, quantity and quality of water in the subsurface.

Hydrology, the movement of water at the surface, including quantity, geomorphology and sediment transport.

Surface water quality, the consideration of the water's quality during diversion into the reservoir, storage, and subsequent release.

And fish and fish habitat, the consideration of the implication of the project on fish species in the project area and further, including consideration of impacts to the habitat used by fish.

These reviews and related conclusions are found in the respective sections of the environmental impact assessment and supplemental information requests. However, it's worth briefly touching on each at this time.

Hydrogeology implications of the project involved

examining the potential changes to groundwater quality ad quantity that may be associated with the project. Through the use of an extensive borehole drilling and well-testing program, data was obtained and a numerical model created to predict the implications of both dry and flood operations and other factors on groundwater levels, flow regime, and water quality. The models showed that any effects on groundwater would be rare and reversible on release of water from the reservoir, and would not extend beyond the project development area at any magnitude that would be material.

Similarly, consideration of hydrological effects was undertaken primarily through examination of impacts to the hydrological regime, changes in suspended sediment transport, and changes in channel geomorphology. Changes to the hydrological regime are non-existent when the project is not in operation, and the flow rates and flow volume in the Elbow River will not be significantly impacted by the project. As the project is designed to mitigate flooding downstream, there will be reduced flow rate and volume downstream when the project is in operation. Suspended sediment transport will be impacted during diversion with sediment being removed -- being moved into the reservoir and deposited. As a result of the reduced

flow during operations, there will be some minor changes to the Elbow River channel between the outlet and the Glenmore Reservoir over the long term.

Surface water quality was assessed for changes to various parameters, including temperature, oxygen, total suspended sediment, or TSS. One of these -- of these, primary consideration is TSS. Operation of the project will occur at a time when TSS in the Elbow River is already high owing to the flood event. The project would not change or alter this fact.

Turning to issues of potential impacts on fish and fish habitat, Stantec, on behalf of Alberta Transportation, has completed extensive fish and fish habitat surveys within the Elbow River to support the aquatic ecology components of the EIA. Field work was undertaken in 2016, with additional surveys in 2019 and 2020. These surveys provide a robust basis to support both the EIA, and to inform monitoring on offsetting plans.

Surveys covered approximately 70 kilometres of the river and use advanced methods of estimating habitat change such as a bedload model and a habitat suitability model. In addition, REDD surveys -- and that's R-E-D-D -- and a population survey were completed to characterize fish community, and to inform

the effects assessment and future monitoring efforts. Alberta Transportation's data collection and analysis exceeds the efforts typically undertaken for EIAs. Alberta Transportation's field data will also serve as a comprehensive tool for future monitoring.

With respect to the project design, the design of SR1 has several unique benefits for the aquatic environment relative to a typical on-stream structure. The off-stream design limits interaction with the aquatic environment to the extent possible by having a small in-stream footprint. Additionally, project's fish package design features mimic natural features of the Elbow River and are considered superior to a classic fishway. The off-stream design avoids the development of a lacustrine or lake habitat, which could substantially change the Elbow River fish community over time. In years that the project does not operate, there will be negligible effect on the Elbow River fish community.

Effects to the aquatic environment are limited to flood operation, primarily the risk of fish entrainment into the reservoir. Alberta Transportation undertook a robust assessment of aquatic ecology, including an informed evaluation of entrainment risk. While there is some uncertainty in predicting the nature of fish

behaviour in a flood, and the risk of entrainment during diversion, Alberta Transportation has undertaken extensive efforts, using the best available science, to characterize the risk to fish during flood operations.

Even though residual effects to fish are predicted to be not sufficient, Alberta Transportation is committed to monitoring effects to fish during flood operation and will offset the potential loss of productivity as per the requirements of the federal *Fisheries Act*.

Alberta Transportation acknowledges that during flood operations, there is potential for the project to interact with bull trout and its critical habitat. The upper reaches of the Elbow River are considered important habitat to bull trout, a species that requires complex riverine habitat. The project location in the downstream extents of the Elbow River provides the benefit of limiting interaction with bull trout to the extent possible. The field studies conducted for the project demonstrate that bull trout are predominantly located in areas that are upstream of the project. Alberta Transportation's population fieldwork in August included 186 bull trout captures in the Elbow River, the majority of which were located near the confluence with McLean Creek, Allen Bill Day

Use Area, and Paddy's Flat. These findings align with the findings of other scientific studies on bull trout abundance and distribution in the Elbow River. Residual effects to bull trout and its critical habitat are predicted to be not significant, based on their distribution in the upper reaches of the Elbow River, and the infrequency of project operations.

Alberta Transportation is committed to offsetting residual effects to bull trout and its critical habitat that cannot be mitigated and is consulting with Fisheries and Oceans Canada to develop an offset plan that meets the conditions of both the *Species At Risk Act* and the *Fisheries Act*.

In summary, the team members responsible for hydrogeology, hydrology, surface water quality and fish have each consider the project's associated impacts in great detail and are confident that the impacts are well understood, temporary, or can be monitored.

Further, there have been a number of statements suggesting that Alberta Transportation is simply relying on future monitoring to mitigate the effects of SR1. In fact, where adverse effects have been predicted in the EIA, Alberta Transportation has identified specific measures to mitigate those effects. Draft monitoring programs have been developed for

several valued components to verify the effectiveness of planned mitigation measures, and to allow for continued through through adaptive management. Monitoring programs are an important tool to reduce uncertainty in outcomes. In addition, the development of these plans is also a requirement of both the terms of reference and the CEAA EIS Guidelines for the project.

In relation to the concerns raised by the Stoney Nakoda Nations on these issues, a review of the SR1 EIA was prepared by Stoney's consultants, PGL, and it's subconsultant, Boreal Water Resources Ltd., touching upon two specific topics: Hydrology and aquatic ecology, and to provide comments regarding the scientific and technical sufficiency of the assessment.

Stantec carefully reviewed the submissions prepared by Stoney Consultation and PGL, and provided a detailed response, which is included as part of Alberta Transportation's reply submission. Our responses to Stoney Consultation and PGL are included in Exhibit 324, at Appendices K and L respectively.

As a general statement, PGL's review seems to not have considered material filed by Alberta Transportation in multiple rounds of federal and provincial information requests subsequent to the

submission of the EIS in 2018. Further, Alberta Transportation has fully responded to the questions and concerns that Stoney Consultation and PGL have raised through the course of the environmental assessment process for SR1, and disagrees with PGL's conclusion that the potential residual adverse effects of the project on hydrology and aquatic ecology have been underestimated.

I will now invite Mr. Hebert to make further comment.

A. MR. HEBERT: Thank you, Mr. Brescia.

Mr. Chairman, in closing, Transportation wishes to acknowledge the concerns raised in relation to this very important issue.

Transportation is committed to constructed -- constructing and operating the project in a manner that minimizes impacts to water, to conduct robust and effective monitoring, and when necessary, using well established and proven mitigation measures.

Specifically, Transportation has committed to an extensive and long-term monitoring program of both surface water and groundwater. This robust monitoring program will cover multiple disciplines. Details of these programs are contained in the drafts for each of the surface water monitoring plan; the groundwater

monitoring plan; and the fish rescue and fish health and monitoring and mitigation program.

Transportation's commitments to these measures is not limited to project construction, but rather is a commitment for the entirety of the project's operational lifespan.

Alberta Transportation is confident that through the rigorous EIA process, including responding to supplemental information requests at both the provincial and federal level, along with engagement and consideration of matters raised by Indigenous groups, local residents, stakeholders and their respective experts, we have a solid of understanding of the implications of the project on water. Furthermore, the monitoring regime will act as a verification of these conclusions and will guide implementation of mitigation measures when and if needed.

Thank you, Mr. Chairman.

MR. BARBERO: Mr. Hebert, Mr. Brescia, thank you both.

Mr. Chair, sir, I see that I'm quickly approaching the end of my time. There was one final matter.

I would like to invite Mr. Yoshisaka to speak to one correction that he has in relation to Exhibit 157.

Mr. Yoshisaka.

A. MR. YOSHISAKA: Good morning, Mr. Chairman, members of the Board. In my review of the filed materials this weekend, I did note the occurrence of a minor errata to one of the figures that were presented in Exhibit 157, specifically at page 9. The figure here relates to some modelling results, and the error is limited to the legend.

So it is a minor correction to the legend to address some of the labelling that's within that legend, and we do have a corrected version of that figure that we are ready to submit into evidence to correct the record.

MR. BARBERO: Thank you, Mr. Yoshisaka.

Mr. Chair, I will submit that we will provide a copy of the revised page 9 if that is agreeable, sir?

THE CHAIR: Yes, please do.

MR. BARBERO: Thank you, Mr. Chair.

Sir, that concludes the direct evidence of Alberta Transportation on Topic 4. This Panel is now available for cross-examination.

THE CHAIR: Thank you, Mr. Barbero.

I'm assuming, Mr. Cusano, you have no cross here?

MR. CUSANO: That's correct, sir. Thank you.

THE CHAIR: Thank you.

And Ms. Senek?

MS. SENEK: Nothing for the City, thank you.
THE CHAIR: Thank you.
Mr. Rae, Stoney Nakoda.
MR. RAE: Yes, sir. I do have a couple of questions.
THE CHAIR: Thank you, please proceed.

MR. RAE CROSS-EXAMINES THE PANEL:

Q. Mr. Hebert, last week, Mr. Frigo from the City of Calgary stated that he meets weekly with Alberta Environment and other water managers and license holders on the Bow River. He also mentioned that the City works with both the downstream and upstream municipalities.

Given that those meetings, I believe, are organized and chaired by Alberta Environment, does Alberta Transportation know the reason why Stoney Nakoda representatives have not been included in those meetings?

A. MR. HEBERT: Mr. Chairman, I do not.

Q. Would you undertake to ascertain via Alberta Environment on what basis the Stoney Nakoda have not been invited to participate in those meetings?

MR. BARBERO: Mr. Chair, it's Michael Barbero here, Alberta Transportation. I'm not quite sure that I understand what Mr. Rae is asking us to do. If he's

asking us to go and ask why another government department is not meeting with the Stoney Nakoda, I don't know if that's an appropriate undertaking.

MR. RAE: Mr. Chairman, quite frankly, that is exactly what I'm asking.

MR. BARBERO: Well, sir, with all due respect, I'm not sure that that's something we can really do. So I don't believe Alberta Transportation is prepared to give that undertaking, sir, unless there's some other reason or rationale that you can help me understand.

MR. RAE: Mr. Chairman, earlier Alberta Transportation advised the Board that any commitments that it makes would not be binding on Alberta Environment, but if I understand the evidence correctly, Alberta Transportation also said that were any of those -- any of those commitments made into conditions, then those would be binding on Alberta Environment.

Perhaps I will ask my follow-up question, and that can make it clear to the panel where I'm going with this undertaking. And my follow-up question is simply: Will the Stoney Nakoda be included in similar weekly meetings that Alberta Environment were advised as promised for the management of the SR1 project on the

Elbow River, were it to be constructed.

A. **MR. HEBERT: So, Mr. Chairman, certainly as part of the operations of SR1, Environment and Parks anticipates that it would -- it would engage with impacted stakeholders. The exact details of the necessity, nature, scope of that engagement is not -- is not confirmed at this time, but I would expect that environment at an operational phase would engage with Indigenous groups on appropriate topics relating to the project's operations.**

Q. Mr. Hebert, is it, therefore, acceptable to Alberta Transportation were a condition to that effect be added to any SR1 project approval; that is, a condition mandating that the Stoney Nakoda be part of these Alberta Environment meetings?

A. **MR. HEBERT: Mr. Chairman, subject to the advice of counsel, we'll undertake that item. We'll take that item as an undertaking.**

UNDERTAKING - TO ADD A CONDITION MANDATING THAT THE STONEY NAKODA BE PART OF THE ALBERTA ENVIRONMENT MEETINGS FOR THE MANAGEMENT OF THE SR1 PROJECT ON THE ELBOW RIVER, WERE IT TO BE CONSTRUCTED

Q. MR. RAE: Now, Mr. Hebert, last week we also

had a discussion, both with yourself and your panel, as well as the panel from the City of Calgary, in regard to the 2016 Alberta -- TransAlta Utilities agreement concerning water management of the Ghost Reservoir.

Pursuant to an undertaking, the City of Calgary subsequently advised us that it does not have a copy of that 2016 agreement to provide to the Stoney Nakoda, nor presumably to this Board -- to the Natural Resources Conservation Board.

Will Alberta Transportation provide a copy of this agreement to the Stoney Nakoda?

A. MR. HEBERT: **Mr. Chairman, the agreement in question is under the authority of a different government department, and we would not be in a position to provide a copy of that agreement.**

UNDERTAKING - TO PROVIDE THE 2016 TRANSALTA UTILITIES AGREEMENT CONCERNING WATER MANAGEMENT OF THE GHOST RESERVOIR TO THE STONEY NAKODA - REFUSED

Q. MR. RAE: And just so I'm clear on your answer, Mr. Hebert, why is Alberta Transportation not able to provide a copy of that agreement?

A. MR. HEBERT: **Mr. Chairman, the agreement is under the authority of Alberta Environment and Parks.**

We would not have a copy of such agreement.

Q. You do not have a copy of the agreement -- you have not had access to that agreement; is that your evidence?

A. MR. HEBERT: Mr. Chairman, as far as my role in advancing the SR1 project, I have not had access or had need to access that agreement.

Q. So is it your evidence that you're not aware of the arrangements that TransAlta Utilities uses in operating the Ghost Reservoir?

A. MR. HEBERT: Mr. Chairman, I believe it's a matter of public record that Alberta Environment entered into an agreement with TransAlta as an operator of the -- the water management projects in the Bow River relating to flood mitigation. I don't think that's a secret, and I'm aware of that.

But, as far as an agreement is concerned, Alberta Transportation does not have a copy, nor have I had need to obtain a copy as part of the administration of advancing the SR1 project.

Q. Well, you say the terms of the agreement are a matter of public record, and yet you're saying you don't -- haven't seen the agreement, and you don't know what's in it. So how do you know what arrangements TransAlta Utilities and Alberta Environment have made in regard to the flow through the Ghost Reservoir?

A. MR. HEBERT: Mr. Chairman, I said that the agreement is a matter -- an agreement between environment and TransAlta is known to the public; I didn't say that the terms are known to the public, so I think that's an important clarification.

Q. Does Alberta Transportation not think it relevant to the SR1 project that it knows the details of the agreement, not just what's been publically released?

A. MR. HEBERT: Well, Mr. Chairman, Alberta Transportation has the mandate to advance the SR1 project through its development and regulatory phases.

The -- the broader responsibility for the administration of water projects and need necessity of different water projects falls under the administration of Environment and Parks.

Certainly we understand the role that the -- the agreement between Environment and TransAlta play within the broader scope of flood management projects, but I personally, and on behalf of Transportation, do not see the connection between the application we have in front of this Board today and the agreement or flood mitigation -- sorry, the agreement in place to manage water levels on the Bow River with TransAlta Utilities.

MR. RAE: Mr. Chairman, if I might, both Alberta Transportation and the City of Calgary have

provided a great deal of evidence in the past week in regard to the SR1 project and how it will reduce flood flows on the Bow River downstream of the Elbow River confluence. Flows out of the Ghost Reservoir into the Bow River, therefore, are directly relevant to these purported benefits of the SR1 project on Bow River flows downstream of the confluence.

So I think the terms of how the Ghost Reservoir's management and the water release levels out of the Ghost Reservoir are highly relevant to the purported benefits of the SR1 project.

And, Mr. Chair, maybe I could short-circuit where we're going here and simply represent to the Board that it's the Stoney Nakoda position that this Board has within its power to compel disclosure of this type of agreement. And we've heard evidence in the past week of a number of, I will label them secret agreements, because I believe that's what they are. We've heard evidence of a number of secret agreements entered into by various departments of the government of Alberta that directly relate to the SR1 project, both its planning, its construction and its purported benefits.

We would, therefore, ask that this Board, the Natural Resources Conservation Board, consider compelling Alberta Transportation to so disclose those

agreements. And I'll leave it at that and not pursue further the queries in regard to the undertaking that I understand has been refused by Alberta Transportation.

MR. KRUHLAK: Mr. Chairman, it's Ron Kruhlak. I wonder if I might briefly respond.

THE CHAIR: Yes, please go ahead.

MR. KRUHLAK: Mr. Chairman, I think Mr. -- my friend, Mr. Rae, is well aware that it's not uncommon in the nature of advancing projects and dealing with different parties' interest to enter into arrangements that have confidentiality provisions, and which I assume his own client embarks on on a regular basis.

Mr. Hebert has explained the nature of those arrangements, and we would maintain that it is inappropriate and probably irrelevant to make the request and have the request fulfilled as he's requested it in this matter.

THE CHAIR: Mr. Rae?

MR. RAE: Mr. Chairman, I'd simply say that the proponent here is a public body; it's the government of Alberta, it's Alberta Transportation, a department of the government of Alberta. And those confidentiality norms that my friend Mr. Kruhlak is referring to simply don't apply to the government of Alberta. This is a public body, it should be

disclosing -- if it even has the power in the first place, it should be disclosing these secret agreements.

THE CHAIR: Mr. Rae --

Sorry, go ahead, Mr. Kruhlak.

MR. KRUHLAK: I was just going to say, Mr. Chairman, that these are not secret agreements; they're various agreements, as there are with landowners with respect to commercial arrangements and other parties. They are not -- we would not be producing them. It's -- we're not able to produce them, having regard to the nature of the agreements.

And I guess -- and I was obliged to respond, we were sitting quietly during Mr. Rae's questioning with respect to third-party arrangements with TransAlta Utilities and others with respect to the Bow River, and we would continue to maintain, Mr. Chairman, that those inquiries are not relevant for the nature of the project that is before this Board, which is the SR1 project.

I appreciate Mr. Rae's concerns about calculating benefits and costs, but that -- that -- that inquiry can go a long way. And we would, again, submit that it's not relevant to the issues which this Board has to contend with, and that's whether this project is in the public interest.

THE CHAIR: Mr. Rae, you've asked the Board to weigh in on that. We will caucus on your request that the Board ask that information. I would suggest that we could probably do that later -- I don't think it's urgently needed right now, but we will do that and get back to the hearing with an answer to your request for the Board.

MR. RAE: Thank you, Mr. Chair.

Those are all my questions I have for this panel.

THE CHAIR: Okay, thank you, Mr. Rae.

Mr. Secord or Ms. Okoye? I'm not sure who's leading this section.

MS. OKOYE: That would be Mr. Secord.

THE CHAIR: Okay, Mr. Secord?

MR. SECORD CROSS-EXAMINES THE PANEL:

MR. SECORD: Thank you, Mr. Chair.

Q. My first series of questions will be on climate change.

Can you tell me, Mr. Hebert, who the panel will be responding to those questions?

A. MR. HEBERT: Just one moment, Mr. Secord.

Mr. Secord, there's at least one or two individuals on the panel that are in a position to respond on the topic of climate change. So if it's okay with you, we can proceed with asking the questions and I will direct traffic appropriately.

Q. And who are they?
A. MR. HEBERT: It would be Mr. Wood and Dr. Luzi are the individuals.
Q. And Dr. Luzi has been put forward as an expert in hydrogeology; correct?
A. MR. LUZI: That is incorrect.
COURT REPORTER: Sorry, who was that?
A. MR. LUZI: Sorry, Mr. Chair, it's David Luzi speaking for AT. I'm an expert in hydrology and geomorphology.
Q. MR. SECORD: Yeah, I had written down that you were the lead for hydrology, so how is that incorrect, what I just said?
A. MR. LUZI: Mr. Chair, you said "hydrogeology."
Q. Okay. I meant to say lead for hydrology. I misspoke. So you're -- so I have you -- that's what I wrote down. So you're the lead for hydrology, and are you also a climatologist?
A. MR. LUZI: I'm not, sir.
Q. And, Mr. Wood, you've been in all of the panels so far. What are you the lead on?
A. MR. WOOD: I've supported the delivery of the project and some of the technical aspects around hydrology and in preparing some of the responses

related to climate change.

Q. And are you a climatologist?

A. MR. WOOD: No, I am not.

Q. Now, Alberta Transportation has designed the SR1 to address a 1 in 200-year flood. The usual design in Canada for flood mitigation is 1 in 100 years. So this appears conservative; correct?

A. MR. WOOD: Mr. Chairman, I'd just like to make a brief clarification. Alberta Transportation has designed the SR1 project to the 2013 flood or equivalent. It just so happens to be a 200-year event based on some of the current estimates.

Q. Now, in Saskatchewan, it uses a design criteria of a 1 in 500-year event. So if the SR1 was being proposed in our neighbouring province, then this project would be underdesigned.

Can you tell me why AT didn't use a more conservative design flood for SR1?

A. MR. WOOD: Mr. Chairman, again just a clarification. Saskatchewan does use a 500-year flood in their hazard identification program. In neither province does it stipulate exactly to what service level you need to build infrastructure.

Q. Now, the project design flood is predicated on the 2013 event that occurred in the Calgary region. This was

roughly a 1 in 200-year flood. The SR1 design does not accommodate anticipated changes to the hydro climate of the area and the likely occurrence of larger flood based on global climate model or GCM outputs. So how will this achieve the intended goal?

A. **MR. WOOD: Mr. Chairman, again, a clarification. The project does consider floods larger than the 2013 event. In fact, we used GCM models, and their impact on IDF curves to check whether the factor safety applied to the maximum diversion rate of the diversion structure was adequate.**

Q. And which GCM outputs did you look at?

A. **MR. WOOD: I believe that is addressed in the CEAA conformity review Round 1, Part 3, dated August 21st, 2019. And as for the GCMs, what we did use was the RCP 8.5 as it relates to the changes to the IDF curves.**

Q. Now, do you agree that the risk of rate on snow events is projected to increase in the future due to the shortening winter season?

A. **MR. LUZI: Mr. Chair, Dave Luzi speaking. The -- we do not fully agree with that statement, as the future predictions for climate change have different effects depending where you are in the basin.**

Q. So what don't you agree with that statement, what part

of it? You say you don't fully agree?

A. MR. LUZI: You may not necessarily have increased rain on snow events as a result of climate change as you may not have snow in some portions of the basin.

Q. But my question was do you agree that the risk of rate on snow events is projected to increase in the future due to the shortening winter season?

A. MR. LUZI: Again, I think it depends on the robustness of the models. And as we know, and as the City of Calgary also testified, that the predictions of climate change have evolved as our understanding of the physical processes involved change were improved.

Q. So is the risk of rain on snow event projected to decrease in the future, Dr. Luzi?

A. MR. LUZI: No, I did not say that, sir. I believe I said that there is uncertainty for that prediction.

Q. So there is a risk, then, that it may increase in the future?

A. MR. LUZI: Correct, you could say that.

Q. Do you agree that this is anticipated to result in a much larger flood than the 2013 event in the future?

A. MR. LUZI: Mr. Chair, Dave Luzi speaking again. No, I would not. Again it depends where in the

basin you are -- are assessing that effect.

Q. And where in the basin if you were assessing that effect would it result in much larger floods than the 2013 event?

A. MR. LUZI: Again, Mr. Chair, Dave Luzi speaking again. I think, again, the uncertainty of how climate change will affect differences in the front ranges and in the headwaters of the rivers that feed into the City of Calgary, those impacts have shown to be varied with potentially more flooding occurring up in locations around the Banff area, for example. But by the time you reach Calgary, the actual instantaneous peaks are not expected to be any different under climate change.

Q. Now, the design configuration for SR1 is influenced by the conditions experienced in the Elbow River catchment area in 2013; correct?

A. MR. WOOD: Mr. Chairman, this is Matt Wood. That is correct.

Q. And how is this considered reasonable when other options like MC1 can mitigate much bigger floods?

A. MR. WOOD: Mr. Chairman, as we stated around -- on Topic Day 1, MC1 does not necessarily mitigate bigger floods. Maybe -- maybe perhaps if I could ask if Mr. Secord rephrases the question?

Q. The question was the design configuration for SR1 is influenced by the conditions experienced in the Elbow River catchment area in 2013. And you agreed with that. And my question was how is this considered reasonable when other options like MC1 can mitigate much bigger floods?

A. MR. WOOD: Mr. Chairman, if I may point out, MC1 did have the same design basis as SR1 as reducing flows downstream of Glenmore to 170. But I think, more importantly, is that SR1 is designed to mitigate flooding larger than that, which occurred in 2013, because of the factors of safety applied to the design.

Q. Now, I guess this is -- these questions I'll put out there, and I guess one or other of you will deal with them, or, Mr. Hebert, you'll direct them to somebody else.

Do you agree that the paleo records indicate that there have been several extended wet periods in the past that would have influenced flood potential?

A. MR. LUZI: I guess I could take this. This is Dave Luzi, Mr. Chair.

The -- I believe Mr. Secord, can I ask a point of clarification? Are you referring to the evidence presented in the tree ring data?

Q. Yes.

A. MR. LUZI: Dave Luzi again. I would just like to clarify that the tree ring data is an interesting source of historic hydro climatic information and is useful when describing, you know, periods of wet and periods of dry in the observable tree ring record.

But as the -- in the evidence presented, if you look at the papers that were referred to, those papers acknowledge that, that that information is really more for transient and does not necessarily reflect peak flows or how the rivers respond.

And also the authors of some of those papers pointed out that the tree ring information does not seem to correlate really well with mountainous environments, which is the bulk of flows in the Elbow River.

Q. But Dr. Luzi, that wasn't my question. My question was do you agree that paleo records indicate that there have been several extended wet periods in the past that would have influenced flood potential?

A. MR. LUZI: This is Dave Luzi again, Mr. Chair. I do agree that the paleo records seem to show extended wet periods and dry periods. But, again, I would like to clarify that that does not translate necessarily into the peak flows.

Q. And how has this paleo record information been used by AT and Stantec?

A. MR. WOOD: Mr. Chairman, this is Matt Wood. If I may. That information has not been used. Again, SR1 was designed to the flood of record. And I believe on previous days, I've referred to that being the hydrometric records, the measured data on the river during that specific flood event.

Q. And why weren't the paleo records used or considered by AT or Stantec?

A. MR. WOOD: Mr. Chair, it's Matt Wood again. If I may. And as Mr. Luzi pointed out, those records don't necessarily correlate to event-based metrics. So when we're looking for a specific flow to design SR1 to, that type of information which is being referenced does not provide us with that.

And so, you know, as is common practice, we look to the hydrometric records kept by the federal government, Water Survey Canada, and use those as part of the design basis.

Q. Do you agree that paleo records also indicate the occurrence of extended drought conditions, yet there has been no assessment by AT or Stantec of how drought might increase the risk to Springbank residents from windblown dust originating from sediment accumulated in

the SR1 reservoir. Why has this been ignored by AT?

A. MR. WOOD: Mr. Chair, this may be a question best for the air quality data, but while there may be periods of drought in that record, I think you'll find that the assessments done as part of that response to the questions around air quality were quite conservative.

Q. So do I understand, then, that the climate change questions aren't totally reserved for Topic Blocks 3 and 4, that you're also expecting climate change questions to be addressed by the panel of Topic Block 5? And maybe, Mr. Barbero, can you confirm that or -- one of your colleagues?

I just want to make sure that I've got the right people to answer my questions now and I don't want to get to Panel 5 and then find out oh, sorry, you should have asked that question in Topic Block 4.

A. MR. HEBERT: Mr. Chairman, if I may, Wayne Speller is prepared to provide a response.

A. MR. SPELLER: Mr. Chair, it's Wayne Speller.

So Mr. Secord, our discussions on sediment management and air quality, our witnesses for that are focused on Topic Day 5. So if you do have questions related to that, that might be a better time to pose them. We'll have the right people in the room to

answer them for you.

Q. MR. SECORD: And will that include AT's failure to assess how drought might increase the risk to Springbank residents? And I'm thinking now, looking at the -- looking at the paleo records' extended periods of drought, you're going to say I'm going to get answers to those questions in Topic Block 5 on the climate change aspect?

MR. BARBERO: Well, Mr. Secord, I don't think --

COURT REPORTER: Sorry, who's speaking?

MR. BARBERO: Michael Barbero, Alberta Transportation.

And I guess I'm getting a little confused, sir, at what you're asking, and it's not for this panel to answer that question. And as you rightly say, it's probably for you and I and the Chair to discuss, but if you have questions about climate change, we're here to talk about climate change today. If you have questions about air quality, we're here on Topic Day 5 to talk about air quality. I'm not sure that I'm understanding the distinction that you might be making, sir.

MR. SECORD: Okay, so let's try this again.

Q. MR. SECORD: Do you agree that the paleo records also indicate the occurrence of extended drought conditions, yet there has been no assessment by

AT of how drought might increase the risk to the Springbank residents from windblown dust originating from sediment accumulated in the SR1 reservoir?

A. MR. WOOD: Mr. Chairman, this is Matt Wood here. If such extended periods of drought occurred, then it's assumed that SR1 may not be operating.

And so I'm not too sure what the concern is in that regard.

Q. So, Mr. Wood, assuming that SR1 has operated and has sediment accumulated on the floor of the reservoir, have -- has AT assessed how extended drought conditions might increase the risk to Springbank residents from windblown dust as a result of climate change?

A. MR. WOOD: Mr. Chair, as stated earlier, I believe that's best put to the folks who are looking at air quality risks.

Q. Is it possible that in the future during mega drought conditions, the City of Calgary may want to use SR1 for water storage to mitigate the City's desperate need for water?

A. MR. WOOD: Mr. Chair, it's Matt Wood here. There are currently no plans to provide permanent pool water storage in SR1, and I don't believe Mr. Frigo had requested that, based on his testimony in previous days.

Q. So you can confirm that this is not the intended purpose of the structure because water is to be drained within 40 or so days after a flood event; correct?

A. MR. WOOD: Mr. Chair, it's Matt Wood again. The water is to be drained following a flood event, yes. And how will the Springbank residents be assured that this structure will not be used for longer term storage of water in the future?

A. MR. HEBERT: Mr. Chairman, it's Matt Hebert. We've not put forward an application to operate the structure for water storage. There'd be no -- without citing the specific authorities. But I think in brief, Alberta Transportation and Alberta Environment won't have the authority to operate the structure for storage purposes. That would be the assurance provided.

Q. Do you agree that extended droughts may result in enhanced ground cracking from desiccation of the exposed soils in response to a lowering of the water table?

A. MR. YOSHISAKA: Mr. Chairman, it's Dan Yoshisaka speaking.

MR. SECORD: Sorry, who?

A. MR. YOSHISAKA: It's Dan Yoshisaka speaking.

Q. Sorry, I didn't see anybody popping up on the screen.

Good morning.

A. MR. YOSHISAKA: Good morning, Mr. Secord.

There is some potential for, you know, desiccation cracking as a result of drying out of those upper sediments; however, under our current understanding of the groundwater conditions in the area is that the water levels are quite near surface, and as such, the potential for those cracks that develop is quite limited to the upper metre or two of material.

Q. And are you speaking now in circumstances of extended droughts in a climate change scenario?

A. MR. YOSHISAKA: No, I'm not. I'm speaking in terms of the baseline conditions as they have been observed currently.

Q. So my question was do you agree that extended droughts may result in enhanced ground cracking on the desiccation of the exposed soils in response to a lowering of the local water table?

A. MR. YOSHISAKA: There is a potential for that to -- to happen as a result of lowering of the groundwater table.

Q. Do you agree that this will compromise the glacial clay layer acting as a seal on the base of the SR1 reservoir?

A. MR. YOSHISAKA: Mr. Chairman, no, I would not

agree with that -- that statement.

The water levels in the area are controlled by a number of different factors, one of which is the topographic drivers in the area which tend to focus flow towards the areas underlying the reservoir.

So with that in mind, no, we don't anticipate that the glacial till materials which underlie the reservoir would be able to completely desiccate.

Q. And is does your answer factor in extended droughts like we've seen in the paleo records?

A. MR. YOSHISAKA: Our answer would be based upon our understanding of the mechanisms that control groundwater movement and groundwater flow patterns in the area.

It's important to note that there is a fair bit of topographic relief in this area. So what ends up happening, due to the relief, is that the flow directions are, you know, continuously driven down into the lower lying areas, including the reservoir area. And with that in mind, we -- we, you know, understand that those areas will be saturated and remain hydrated, and thus the potential for desiccation cracking is reduced.

A. MR. BACK: This is Dan Back. If I could interject a little bit here. I'm not a climate

scientist.

Q. Mr. Back, you're not on. But I think the court reporter can't see you.

THE CHAIR: Thank you.

A. MR. BACK: Sorry, I'm not a climate scientist, but I am a geotechnical engineer. And I can say the moisture in the soil doesn't necessarily follow the specific groundwater level, particularly in the clay soil; it pulls the moisture up quite a lot.

I couldn't speak to what might happen in a huge mega drought than what has happened in the past. But in geologic time, our experience with clay soils is that we see desiccation down to a depth of no more than about 2 metres. And below that level, deeper groundwater will feed water into the soil by capillary action, and we have a minimum impact deeper than that in terms of fracturing or cracking of the soils below.

Within our design, we generally considered a depth of about 2 metres for both freeze/thaw and desiccation in the design of the SR1 storage dam.

Q. So Mr. Yoshisaka, do you agree that enhanced leakage from the base of the SR1 structure may occur as a result of this enhanced ground cracking from an extended drought like we've seen in the paleo records in the past?

A. MR. YOSHISAKA: Mr. Chairman, members of the Panel, as Mr. Back has pointed out, the process of drying out very fine grained materials such as clays is -- is limited.

There is, you know, a lot of surface tension within those materials due to their, you know, tiny mineral grain sizes tend to retain water within them, even though there may not be a refresh source of water percolating down through them.

And, you know, with that in mind, I would also like to point out to the Board that our modelling does provide some provision for reduced hydraulic conductivities within those upper few metres underneath the reservoir to account for things like this.

Q. So Mr. Yoshisaka, then, how do you explain the presence of fractures down to 10 metres or more in depth under SR1?

A. MR. BACK: This is Dan Back. We did not encounter any fractures in our investigation of the soils at the SR1 reservoir embankment location.

Q. So you're saying there are no fractures beneath the SR1 reservoir?

A. MR. BACK: I can say in the boreholes that we advanced, we did not observe evidence of fractures. I cannot say emphatically that there could be none within

the reservoir.

We advanced a lot of boreholes under the embankment and within the reservoir and did not see any evidence of it.

Q. And who on the panel was involved in the development of the numerical groundwater model?

A. MR. YOSHISAKA: That would be myself.

Q. Can you advise how the potential for enhanced leakage from the base of the SR1 structure was accommodated in the groundwater model? I think you mentioned something about K values a moment ago.

A. MR. YOSHISAKA: That's correct, Mr. Secord. Our model is based upon a geologic model of the area that was developed based on over 2,000 borehole records within the regional assessment area.

So it's a robust geologic model that was derived based on regional information, as well as local project-specific information for boreholes that we drilled within the project development area.

So this geologic model identifies the presence, distribution, thickness of the underlying clay materials, and there are actually two different clay units underlying this reservoir area that both have very low permeabilities associated with them.

Now, within the model, within the upper layer of

the models, so this is the first layer underlying the reservoir area. We did discount some of the hydraulic conductivity values, so we actually assigned them to be higher, more permeable than what we actually measured in the field, and this was done to be conservative in our approach and again account for some of that potential.

Q. Now, with respect to enhanced leakage from the base of the SR1 structure occurring as a result of enhanced ground cracking driven by climate change, can you advise, how has this been assessed, accommodated in any risk assessments conducted using the model?

And I don't know, would that be Ms. Noble dealing with the risk assessment aspects? Or does that stay with you, Mr. Yoshisaka, as the manipulator of the model?

A. **MR. YOSHISAKA: I believe Ms. Noble's involvement of risk assessment is more pertaining to human health. So yes, I could speak to the model.**

Again, Mr. Chairman, I'd like to point out that, you know, the model is very conservative in the way that it's been constructed. Again, some of these low permeability units, of which there are two, we have assigned values in there that were up to two orders of magnitude higher, meaning higher permeability than

what's observed in the field.

Further to that, we also embarked on a bit of an exploratory sensitivity analysis as we would term it. And within that simulation result, we actually turned up permeability values within the till by three orders of magnitude, so increased them by a thousandfold.

And again, I would caution you to understand that the context of those results is to, you know, provide an end member in examining a what-if scenario. So what if the permeability values within those tills were again up to a thousand times higher than what we measured in the field, what would the outcome be.

And with that simulation in mind as well, we understand that the effects, even under those conditions, would still be relatively localized. They do extend further out than what we carry in our project case; however, we do have an understanding of what enhanced permeability within those tills could mean, in terms of characterizing those effects.

Q. Is there a possibility that the borehole drilling missed fractures intervals given that the fractures may be vertical?

A. MR. BACK: This is Dan Back.

I could say that obviously if the refracture's in locations that we didn't drill is a possibly that we

might have missed them, but given the very substantial number of boreholes that were advanced through the clay soils at the project site, it seems unlikely that they would be extensive and pervasive, and we would not have encountered them.

A. MR. YOSHISAKA: **Mr. Chairman, I'd like to add to that response, as well. I believe it's actually within the evidence of SCLG's experts that there is the presence of swelling clays in these areas. And given that the clays and tills underlying this area are permanently saturated, the presence of those clays, you know, should a fracture happen -- happen to form will anneal those fractures. That swelling action will tend to close off those fractures and, you know, close them off such that the bulk matrix hydraulic conductivity is maintained.**

Q. Can you confirm, Mr. Yoshisaka, that you didn't increase the K value for the clay in the model, and why was that?

A. MR. YOSHISAKA: **So the hydraulic conductivity values for those upper clays were already assigned higher values than what we measured. So we didn't, in addition within that sensitivity run, increase them further because they were already set at conservative values.**

Q. Would you agree, Mr. Yoshisaka, that swelling clays would dry under a lower water table driven by climate change?

A. MR. YOSHISAKA: Again, there is some potential for that; however, within those sensitivity runs, you know, we did assign values that were up to a thousand times more permeable within the reservoir area.

So, you know, the net effect of fractures that could arise from desiccation would be captured well within that range that we established.

Q. So staying on the theme of climate change, I now see that I have an array of aspiring climatologists, but probably back to Mr. Wood and -- and to Dr. Luzi, do you agree that climate change projections are for a more flashy run-off period in the future, i.e. higher peak flows over a shorter duration and over a longer flow period?

A. MR. LUZI: Sorry, Mr. Chair, it's Dave Luzi speaking. I can speak to that, Mr. Secord.

I would disagree with that statement as I previously indicated that some climate forecasts are showing that the Elbow River stages of the city of Calgary, the peak flows will not be increased under climate -- peak flows are not anticipated to be increased at the city of Calgary and the Elbow River

under climate change conditions.

Q. And which climate change projections are you referring to now?

A. MR. LUZI: This to be an ensemble of projections and some of the work, recent work by Dr. Pomeroy and his team with the University of Saskatchewan.

Q. So you're saying that looking into the future, the projections are for a less flashy run-off period in the future, i.e. lower peak flows over a higher duration and a shorter low flow period; you're saying that what you've looked at is the reverse?

A. MR. LUZI: No. I indicated that the models are predicting that the actual peak flow in -- at the city of Calgary by the time that floodway make its way to the city of Calgary is not expected to increase.

Q. So I take it, then -- sorry, go ahead. I don't want to cut you off.

A. MR. LUZI: It was going to say it was kind of what I was indicating earlier that the physical processes, you know, the work that that team has done in their monitoring in the Rocky Mountains shown that there's this separation between the front ranges and the headwater catchments, that the discrepancy between those balances out by the time it heads to Calgary.

Q. So then I take it you can confirm this statement is correct: A more flashy run-off period in the future, i.e. higher peak flows over a shorter duration and a longer low flow period has not been accommodated in the peak flow analysis to ensure that SR1 can achieve its intended goal of flood mitigation?

A. MR. WOOD: Mr. Chairman, it's Matt Wood here. I would disagree with that statement.

We did look at the potential for higher peak flows. Again, I explained that earlier using the University of Western Ontario's IDFCC Tool, we looked at climate-impacted event-based precipitation, and using the most conservative estimates in that tool set.

So while we can discuss the potentials of whether it's bigger flood's getting bigger or smaller floods more frequently, you know, this was looked at in design as far as taking a sort of a bookend approach. Again, we looked at RCP 5 and checked our factors of safety accordingly.

Q. And Mr. Yoshisaka, am I correct, then, that you did not model the groundwater under climate change, and if so, why?

A. MR. YOSHISAKA: Mr. Secord, we -- we constructed the model based on conditions during the 2013 flood.

Q. Is the -- in terms of looking at the global models, is

the general agreement in all of the models that you've looked at, Mr. Wood, the peak flows will be lower?

A. **MR. WOOD: Mr. Chairman, I may ask Dave Luzi to elaborate. But what I believe they're suggesting is that flooding will be more frequent. Flood peaks may increase, but on the extreme end, the very extreme events like those that occurred with 2013, right now, there's not the evidence to suggest that those type of events will become more severe, more frequent.**

Perhaps Dave could elaborate.

A. **MR. LUZI: It's Dave Luzi speaking again.**

I think, as Matt indicated, there is -- like I didn't disagree with your previous statement that there will be more flashy hydrographs. I disagreed with the component that was relating that flashiness to higher or increased peak flows.

I think as the modelling and as we develop more sophisticated physical models of the hydrological processes that drive flow events with the Elbow River and Bow River basins, they found that these scenarios are showing that, you know, the front ranges may have less snow volumes, so the ground snow event may decrease so you get just rain on dry ground. And that would offset the potential rain and snow events in head the ranges, the headwater areas of these basins.

Q. Do you agree that it is true that tree rings only provide an indication of what the annual moisture conditions were like back in time?

A. MR. LUZI: Yes, I think they're developing the sophistication of those things to look at stream flow. But even in the Sauchyn et al. paper that was referenced in Dr. Fennell's, that that was -- that only accounted for about 37 to 44 percent I believe of the variability seen in the stream flow data.

So there is a lot of uncertainty that's unaccounted for.

Q. Do you agree, Dr. Luzi, that floods have a greater chance of occurring during extended wet periods versus extended dry periods?

A. MR. LUZI: No, depending on the areas that I've looked at where I've specifically looked at that relationship, it's not necessarily strong.

Q. Now, you mentioned the Sauchyn and Ilich paper, that's S-A-U-C-H-Y-N, and Ilich I-L-L-I-C-H (verbatim). Do you agree that the reconstructed record of flow on the South Saskatchewan River as presented by Sauchyn and Ilich, and that's referred to in PDF 18 of Dr. Fennell's report, Exhibit 261, we don't need to pull it up unless you want to have it, Dr. Luzi.

So do you agree that the reconstructed record of

flow on the South Saskatchewan River as presented by Sauchyn and Ilich provides an assessment of what flow conditions would have been like back in time?

A. MR. LUZI: Not necessarily. As I indicated that they don't even mention that in their paper.

They're looking at, you know, and kind of a water annual yield on an annual basis, and that's I think where you get the wet and dry cycles from.

But -- and overall, that's like at the South Saskatchewan which is, you know, much further downstream than the river we're talking about currently.

Q. Right. And you can confirm that although this is not specific to the Elbow River, do you agree that it does indicate that there were wet periods when excess flow was occurring in southern Alberta during wetter periods in the climate?

A. MR. LUZI: Excess flow, really I'm not sure if you can say that. Again, it depends on how that precipitation is distributed over on an annual basis.

Q. Given that the Elbow is a tributary of the South Saskatchewan River, do you agree that it is reasonable to assume that the risk for flooding for the Elbow River during wetter climatic periods would be higher?

A. MR. LUZI: Again, sorry, it's David Luzi speaking again, Mr. Chair, apologize. Again, as I -- as I said previously, that the paper itself admits that it doesn't behave well in the headwater areas such as the Elbow River, that even though there are variants in the relationship between tree ring wet and dry periods and stream flow was -- was, you know, in that less than 50 percent, that uncertainty is even greater in snow processed dominated areas like the Elbow River watershed.

A. MR. WOOD: And, Mr. Chairman, if I may supplement Mr. Luzi's comments.

This lack of correlation between the south Saskatchewan and its tributary, the Elbow River, is evident. Document manager, you don't need to bring it up, but in Exhibit 173, page 28 of the PDF, we see the historic flood series for the Elbow River showing events that occurred.

And I would draw the Board's attention to the event in 1932, which was a very major flood; in fact, it nearly damaged the cofferdams at Glenmore while it was under construction. That event is not reflected in these tree ring records on the south Saskatchewan. So, you know, it's pretty indicative that things can happen on the Elbow River that aren't happening on the South

Saskatchewan. And, conversely, things the South Saskatchewan happening that are not happening on the Elbow River.

Q. Now, Stantec notes in Footnote 31 of Exhibit 325, which I think is your response submissions -- and I don't know that you wanted to -- need to turn it up, but if you want to, you can.

Stantec notes in Footnote 31 of Exhibit 325 that tree rings are indicative of annual changes in moisture conditions but are not reflective as specific flood events.

Do you agree that there is no paleo technique available to determine the characteristics of past floods, so this is the best way to gauge what conditions would have been like leading to past floods?

A. MR. LUZI: Mr. Chair, Dave Luzi speaking again. I think that the tree ring method -- and if you look at the literature, the literature that Dr. Fennell referenced in his thing is that these are good indicators of hydroclimatic variability.

Understanding the processes that drive stream flow or peak flows and relating that to tree-ring data in, you know, watersheds such as the Elbow River, I think, is difficult. And I'm not sure that you can extrapolate a tree that grows well or has really robust

years to activity within -- within a river.

Q. But you agree there is no paleo technique available to determine the characteristics of past floods?

A. MR. LUZI: There are some techniques available because we have been able to reconstruct potential flow pathways with some of the old glacial outwash channels, but that's not getting you -- that's getting you a pretty loose approximation of a potential peak flow.

Q. Do you believe, then, it is reasonable to use this tree-ring information to better understand what past conditions may have been like in order to understand if SR1 will achieve its goal of flood mitigation?

A. MR. LUZI: Sorry, Mr. Chair, I lost connectivity there for a second. Could you please repeat that, Mr. Secord?

Q. Sure. So do you agree that it is reasonable to use this tree-ring information to better understand what past conditions may have been like in order to understand if SR1 will achieve its goal of flood mitigation?

A. MR. WOOD: Mr. Chairman, it's Matt Wood here. Maybe I'll take this opportunity to remind the Board that SR1's flood mitigation goal is to mitigate the damages from the 2013 event. While there may be

techniques to extent the paleo climate record, and there may have been wet periods prior to our hydrometric record, it is -- it is industry practice to use the recorded hydrometric data when trying to quantify things like peak flow rates from a given event, which are later used in the design of structures that require very specific peak flow rates for their design.

Q. Now, you note in paragraph 112 of Exhibit 325 the response submissions that Stantec has assessed event-based precipitation to assess the impact of climate change on intensity, duration, and frequency IDF curves, and has come to the conclusion that there is a potential 12 percent increase in the potential for a 1 in 200-year flood to occur.

What does that mean?

A. MR. WOOD: Mr. Chairman, it means -- it means just exactly that, and it's the exercise that I explained earlier where we used a commonly accepted tool that has intensity, duration frequency curves modified for climate change in it. We took the results of that assessment, ran it through the hydrologic model that was built for the Elbow River as part of the PMF study and quantified the effect that those rainfall events, those climate change-effected rainfall events,

would have on event-based flows on the Elbow River. And the result was that the 200-year flood may increase by 2050 by 12 percent.

Q. And what does that mean, "may increase by 2050 by 12 percent?"

A. MR. WOOD: Mr. Chair, it means that these are projections made using very conservative assumptions, specifically the use of the RCP8.5. And looking out to 2050, again, that RCP8.5 means no reduction in current emissions. It's sort of that status quo.

As I believe I pointed out in the response regarding this, many governments have gone to undertake measures to reduce emissions, and so it's questionable whether RCP8.5 is valid. But in the design of SR1 and the assessment that we described here, it is conservative.

Q. You note in paragraph 112 of Exhibit 325, Stantec's response submissions, that Stantec has also included a 25 percent increase in the maximum diversion rate of SR1 as a safety factor; correct?

A. MR. WOOD: Mr. Chairman, this is Matt Wood. That is correct.

Q. Considering the fact that documented flows in the Bow River back in the 1890s have shown greater than 25 percent increases over the 2013 flood, do you agree

that it is reasonable to assume that the Elbow River could have experienced greater than 25 percent flows above the 1 in 200-year flood?

A. MR. WOOD: Mr. Chairman, this is Matt Wood. I would in fact disagree.

We have to refer on the Bow River that that river didn't quite see the same return period as the Elbow did in that event. The Bow River I believe was estimated at being I've seen estimates between a 40 and a 70-year event.

So to compare percentages to those historic events on the Bow and then apply that same percentage to the Elbow, I don't believe it to be valid, and I think it's indicative of how the 2013 event occurred. We had a greater than a 200-year event on the Elbow when the Bow, while it was a very large flood in the record, did not see that level of return period.

And so it would have had a greater relative difference to those historic events that Mr. Secord speaks of.

Q. Aren't we trying to design to peak flow to protect people and property?

A. MR. WOOD: Mr. Chairman, Alberta Transportation's SR1 project is designed to mitigate flood damages to property and infrastructure.

Q. And isn't understanding variability a very big part of the design, Mr. Wood?

A. MR. WOOD: Absolutely, Mr. Chair. It's indicative that variability is something that we consider all through the engineering design process. And as I mentioned earlier, 25 percent, that's a 25 percent increase on the diversion capacity that would have been necessary to meet the 2013 flood goal was added for that very reason, for variability.

Q. And you referenced the average of 12 percent from the climate change models. Can you tell me, was Stantec using the ensemble of the average of 12 percent? You know how these climate change models will give you the average, and then it'll give the 95th percentile, for instance. Can you tell me, was this the ensemble of the average at 12 percent?

A. MR. WOOD: Mr. Chairman, this is Matt Wood. I'm not entirely clear on the question. Perhaps I can aim to respond and perhaps Mr. Secord could clarify.

But the estimate use RCP 8.5; some of the ensembles he may be referring to is the different selections of GCMs and emissions factors.

There is another realm of confidence estimates in this discussion, and that is how it relates to flood frequency and the confidence within those estimates.

Those estimates were done based on the median of the primary confidence curve within those estimates.

Q. Now, this is a reference to Exhibit 327, PDF page 48, where Stantec indicates there's a low correlation between snowpack size and flood peaks in the Elbow River. Do you agree that the fact that the snow packs during flood events tend to be above normal does indicate that they are an influencer on those flood events?

A. MR. WOOD: Mr. Chairman, this is Matt Wood. I wouldn't disagree that snowpack influences flood events.

In response to some of the questions around snowpack, we prepared some graphs showing the snow-water equivalent in the snowpack for every given year and correlated it with years that had flood events.

And to even my surprise, the -- the correlation is not that direct. It seemed to be that some of the years with the largest snowpacks resulted in some of the smallest floods, whereas the years with the largest floods didn't necessarily have the largest snowpack. In fact, many of those were around the median -- I believe 2013 I believe was the 63rd percentile snowpack, not the largest in record, not even close.

Q. So basically --
THE CHAIR: Mr. Secord, maybe listen to this question, get it answered. And then just thinking about a lunch break, so we would likely be pretty close to noon anyway, and we could break till 1.

But please proceed, let's get this question in.
MR. SECORD: I was hoping to beat you to the punch, sir.
THE CHAIR: Oh, I see.
MR. SECORD: I was going to finish this one off and suggest we do that.
Q. So I think you noted --
THE CHAIR: You're cutting in and out, Mr. Secord.
MR. SECORD: Sure. How am I, better, better now?
Q. Okay, so you mentioned the rain-on-snow event that occurred in 2013; the snowpack then was an influencer on that event. You said it was a 65th percentile in terms of snowpack size; did I hear you right, Mr. Wood?
A. MR. WOOD: Mr. Chair, subject to check, I believe it was the 63rd. I don't have the reference in front of me, but it's in that exhibit.
Q. And so do you agree that above-normal snowpacks increase the risk of floods on the Elbow River and that

when combined with a rain event like 2013 which occurred as common upslope condition, this could lead to higher magnitude Elbow River floods beyond the 1 in 200-year event?

A. **MR. WOOD: Mr. Chairman, we can theorize that.**

Again, I had said that snowmelt is a driver, and rain on snow is an important consideration on the hydrology of the Elbow River. However, in the 2013 flood, the run-off, the estimates of snowmelt contribution to run-off are around 10 percent, and 90 percent of that fell as rain.

While it is a risk, we have to remember that this doesn't necessarily revolve around that 200-year event. While we could see more rain-on-snow events, those could result in 10-year floods, 20-year floods, and perhaps more frequently, indicating the necessity for a project like SR1.

MR. SECORD: Mr. Chair...

THE CHAIR: Mr. Secord, that a reasonable break in questioning?

MR. SECORD: It is.

THE CHAIR: And we can pick this up after lunch?

MR. SECORD: Thank you.

THE CHAIR: So let's return at 1:00 everyone, thank you.

(PROCEEDINGS ADJOURNED AT 11:59 A.M.)

PROCEEDINGS ADJOURNED TO 1:00 P.M.

Volume 6
March 29, 2021
P.M. Session

(PROCEEDINGS RECOMMENCED AT 1:00 P.M.)

THE CHAIR: Okay. Mr. Barbero, your panel is ready?

MR. BARBERO: Mr. Chair, I believe everyone is there, yes, sir.

THE CHAIR: Okay. Great. Mr. Secord, you're ready to continue?

MR. SECORD: Thank you.

M. HEBERT, M. SVENSON, W. SPELLER, D. BRESCIA, M. WOOD, J. MENNINGER, D. BACK, D. LUZI, D. YOSHISAKA, D. JOBSON, L. AUCOIN, T. NOBLE (For Alberta Transportation), previously sworn/affirmed, affirmed

MR. SECORD CROSS-EXAMINES THE PANEL:

Q. So Stantec indicates that the five largest floods did occur during times of above normal snowpack. Stantec also went on to show that some of the smaller floods, 1 in 2 and 1 in 5-year events, occurred when the snowpacks were above the 75th percentile, and I think Mr. Wood we chatted about that earlier, and I think the reference there is to your response submissions,

Exhibit 327, PDF page 9; correct?

A. MR. WOOD: Correct. Specifically, page 48, 49, would show the graphs.

Q. Do you agree that, regardless of this data manipulation, it does show that floods did occur when snowpacks were above normal?

A. MR. WOOD: Mr. Chair, I wouldn't necessarily disagree with that.

Q. And, obviously, one needs the right conditions to produce a flood, but would you agree that elevated snow accumulation will exacerbate the flood risk?

A. MR. WOOD: Mr. Chair, I would agree with that.

Q. And if we experience the right conditions in the future with an above-normal snowpack and heavy rainfall, could we get a greater than 1 in 200-year event?

A. MR. WOOD: Mr. Chair, I think that's speculative. I suspect you could -- I may add, and as Mr. Luzi had pointed out, there is some evidence to suggest that snowpack, at least its spatial distribution within the watershed and at lower elevations, may decline due to climate change.

Q. Could we possibly get a 1 in 500 event?

A. MR. WOOD: Again, Mr. Chair, it's Matt Wood. I cannot predict the future.

Q. Well, isn't that what we're trying to look at with climate change, worst-case scenarios?

A. MR. WOOD: Mr. Chair, I believe what we're doing is speculating and making estimates, and as it relates to the design of SR1, we do a sort of a bookend approach to those estimates. As I mentioned, we took our CPA.5, we did a very robust assessment method, one that is endorsed in the province of British Columbia, and showed that the factors of safety that were applied to the design were sufficient.

Q. Could we even get a 1 in 1,000 flood?

A. MR. WOOD: Mr. Chairman, I cannot foresee the future.

Q. Now, would you agree that there is a discrepancy between the percentile values calculated by Stantec for the snow water equivalent exceedances and those calculated using data for the Elbow Summit snow station obtained from Alberta Environment and Parks - Alberta Basins website. Which station did Stantec use to calculate the statistics?

A. MR. WOOD: Mr. Chairman, I believe this was the Elbow River -- Elbow Ranger lookout station.

Q. And where is that shown in the filed materials?

A. MR. WOOD: Mr. Chair, I'm not sure. I'm just trying to recall what's in there. I don't believe we

stated the exact station. I simply put here Elbow River.

Q. Why wasn't the Elbow Summit station used?

A. MR. WOOD: Mr. Chair, I believe, whichever station records snow water equivalent, perhaps it was the Elbow Summit station. Perhaps -- starting to think, I don't think the Elbow Ranger station records snow water equivalent. So I suspect it was the Elbow Summit station, subject to check.

Q. Would you undertake to check and advise me what station Stantec used to calculate the statistics?

A. MR. HEBERT: Mr. Chairman, we expect we'll be able to confirm that at the appropriate time.

UNDERTAKING - TO CHECK AND ADVISE WHAT STATION STANTEC USED TO CALCULATE THE PERCENTILE VALUES CALCULATED FOR THE SNOW WATER EQUIVALENT EXCEEDANCES AND THOSE CALCULATED USING DATA FOR THE ELBOW SUMMIT SNOW STATION OBTAINED FROM ALBERTA ENVIRONMENT AND PARKS - ALBERTA BASINS WEBSITE STATISTICS

Q. MR. SECORD: Stantec indicates that it is not appropriate to assume that precipitation falling earlier in the season will create more runoff.

Do you agree that this assumption has not been

made by Dr. Fennell?

A. MR. LUZI: Mr. Chairman, it's Dave Luzi. I can respond to that. I don't think we've said anywhere that increased precipitation will not lead to increased runoff, just to clarify.

Q. If we could turn up Exhibit 261, PDF page 20.

Now, do you agree that what has been presented in Dr. Fennell's submission is the projected increase of up to 30 percent or more precipitation?

A. MR. WOOD: Mr. Chairman, I believe that's what's stated here, but I should point out that these are mean precipitations.

Q. Do you agree that how that precipitation falls will dictate the risk of flooding, including the magnitude?

A. MR. WOOD: I wouldn't disagree.

Q. And do you agree that the risk of a flood greater than a 1 in 200 event would be higher under a wetter future scenario?

A. MR. WOOD: Mr. Chairman, I believe that is speculative.

Q. Do you agree that when considering peak flows and assessing return periods, it is clear that there is a shift in the frequency of high-flow events during wetter periods?

A. MR. LUZI: This is David Luzi. I can address

that. I don't think we've agreed to that either, Mr. Secord.

Q. Why don't you agree with that, Dr. Luzi?

A. MR. LUZI: We have not seen the evidence to support that. Like, you're talking higher frequency like low-return interval events.

Q. Basically, a shift in the frequency of high-flow events during wetter periods.

A. MR. LUZI: I'm not clear that the current record supports that, sir.

Q. So if we could turn to Exhibit 261, PDF page 23.

So the example that has been provided in Dr. Fennell's submission indicates that a 1 in 100-year event shifts to a 1 in 60-year event or so when the data from winter phases of the climate are assessed separately from the entire period of the flow record.

You followed what Dr. Fennell presented in that regard, Dr. Luzi?

A. MR. LUZI: Mr. Chair, this is Dr. Luzi speaking again. I followed what he did. I'm not entirely clear if it's appropriate for analyzing peak flow events.

Q. Would you agree it also shows that a 1 in 200-year event shifts to a 1 in 100-year event, and a 1 in 500-year event shifts to about a 1 in 230-year event?

A. MR. LUZI: Based on looking in his graph, I think that's what it says, but I do not agree that that's what it means.

Q. And why don't you agree that that's what it means, Dr. Luzi?

A. MR. LUZI: Because I think understanding flood frequencies on peak flow events is a lot more complicated than delineated between characterized wet and dry periods.

Like, when you analyze floods, you need to look at the underlying processes that causes those floods. So knowing whether it's rain on snow or rain or snowmelt, those are the ways you're supposed to look at it and differentiate between those floods, not on whether it's wet or dry.

A. MR. WOOD: If I may supplement Mr. Luzi's answer. We also have to consider the temporal distribution of that event and also the spacial distribution event.

The Rockies and the Elbow River watershed specifically are highly influenced by the way the storm pattern comes in, and this doesn't account for those sorts of things.

Q. Well, when you look at the flood risk probabilities, these all increase during wetter periods; correct?

A. MR. WOOD: Mr. Chairman, risk is the product of consequences and probabilities.

You know, what we've talked about today is potentially more floods, potentially less severe than the 2013 flood but more frequent. That doesn't necessarily mean that the risk profile changes here. It's just a little different.

Q. And if the expectation is for a wetter by up to 30 percent climate, do you agree, then, that one can assume that the flood risk will increase?

For example, do you agree that the shift in frequency of a 1 in 200 to a 1 in 100 event increases the risk from 22 percent to 40 percent over a 50-year period?

A. MR. WOOD: Mr. Chairman, I'm not entirely familiar with the assessment done here by Mr. Fennell. I recognize he separated it into wet and dry periods, but, like I mentioned earlier, we have accounted for considerably larger floods than the 2013 event with the 25 percent factor of safety, and have shown that, even with conservative estimates, event-based precipitation and event-based runoff may change, and we have presented a scenario where it increases by 12 percent, and that falls within the factor of safety.

Q. You said you're not familiar with the work that

Dr. Fennell did, Mr. Wood. Who wrote the response to Dr. Fennell's report in Exhibit 327?

A. MR. LUZI: It's Dr. Luzi speaking. We both -- Matt and I both worked on that response together and we're familiar to the extent of what he did. We just may differ on the conclusions and the projections into the future.

As I've indicated, more recent work with more robust climate modelling have shown that they don't expect that this increase in precipitation necessitates or translates into increased peak flows.

Q. Similarly, do you agree that a shift in a 1 in 500 event to a 1 in 230 event increases the risk from 10 to 20 percent in that same 50-year period?

A. MR. WOOD: Mr. Chairman, I'm going to politely ask that Mr. Secord repeat the question. I was not following.

Q. Sure. So I asked you, for example, do you agree that a shift in the frequency of a 1 in 200 to a 1 in 100 event increases the risk from 22 to 40 percent over a 50-year period?

The second part was, similarly, do you agree that a shift in a 1 in 500 event to a 1 in 230 event increases the risk from 10 to 20 percent in that same 50-year period?

So those were the two questions. And then as a follow-up to that, was any of this considered in the design of SR1 by AT and, if not, why not?

A. **MR. WOOD: Mr. Chairman, I would disagree that there's a direct correlation and risk as such. You cannot just quantify flows, flow magnitude as a direct correlation to risk.**

As I mentioned earlier, a risk involves a multiplier of consequences. And, as I mentioned earlier, climate change and potential effects using industry standard methods for assessing this, for engineering design, were utilized and showed that the factors of safety applied to the structure exceeded those estimates by nearly double.

Q. Now, the design of SR1 does not appear to my clients to successfully mitigate a flood in excess of a 1 in 200-year event, yet there's a good chance that higher magnitude floods will occur in response to greater precipitation, warmer conditions, and an increased chance of rain-on-snow events.

Why was this design limitation overlooked when there are other better options to address bigger flood events like MC1?

A. **MR. WOOD: Mr. Chairman, as I mentioned before, such things were not overlooked, specifically**

the effects of climate change. And like I said earlier, MC1 has the exact same design basis as SR1.

Q. If we could turn up Exhibit 173, PDF 539.

And this is in the paragraph below Table 11. 539?

THE CHAIR: Mr. Secord, there's 480 pages in this exhibit. Do you have the right one?

MR. SECORD: I must not have the right one, let me just check. Either I have the wrong one, or the document host has the wrong one.

THE CHAIR: Right, Ms. Taylor, we are on 173; that's correct? Okay.

MR. BARBERO: Mr. Secord, it's Michael Barbero here, sir. What document are you looking for?

MR. SECORD: Well, I'm just pulling up my version of -- my version of Exhibit 173 has 644 pages, and it is the September 25, 2020, Appendix B hydrology report. So I don't know what --

THE CHAIR: I think Ms. Taylor is going to go the web and just download it again, just make sure we have -- maybe it was truncated or something.

MR. BARBERO: Mr. Secord, sir, again, it's Mike Barbero here. I can confirm, sir, that on our records, Exhibit 173 is Appendix B.

MR. SECORD: Yes, that's what I have in my records, Mr. Barbero. I'm not sure what the Zoom host

had up.

THE CHAIR: There we go. It could be technology at work, folks. Looks like this is working. And Table 11, here we go. Mr. Secord.

MR. SECORD: Yes, I'm just pulling down a bunch of documents off my screen, sir.

THE CHAIR: Just wanted to make sure I didn't lose you.

MR. SECORD: So I can get to my question.

Q. So it is stated in Exhibit 173 Stantec's September 2020 hydrology report, Appendix B, PDF page 539. And the paragraph below Table 11 that: (as read)

> "Therefore, snowmelt was not incorporated in the 2013 model calibration effort."

Given that snowmelt is a notable factor in increasing flood risk, particularly during rain-on-snow events, why was this not incorporated by Stantec?

A. MR. WOOD: Mr. Chairman, if I may bring the Board's attention to the last sentence of that paragraph, it says: (as read)

> **"Furthermore, snowmelt for the PMF model was calculated external from the HEC-HMS (that's the hydrologic model) and entered as a baseflow hydrograph. No**

calibration of snowmelt process were required."

And if I may, perhaps Mr. Menninger can explain some of the detail around that calibration.

Q. That was my next question, Mr. Wood.

So the first question is it states that: (as read)

"Furthermore, snowmelt for the PMF model was calculated external from the --"

Sorry. It says: (as read)

"Therefore, snowmelt was not incorporated in the 2013 model calibration effort."

So, given that snowmelt is a notable factor in increasing flood risk, particularly during rain-on-snow events, why was this not incorporated by Stantec?

A. MR. MENNINGER: Mr. Chairman, this is John Menninger. I can respond to that.

For the specific reasons is that this model has specific purpose, Mr. Chairman. We utilize this HEC -- this hydrologic model to simulate the probable maximum flood.

In order to simulate the probable maximum flood we utilize a rainfall, derived run-off model, coupled with

snowmelt calculations that were then added as a baseflow to the model. We did that in the calibration, as mentioned, and as Matt indicated in the second parts of the paragraph. And then we also incorporated it within the probable maximum flood calculations.

Q. So it goes on to say at PDF page 539: (as read)

"Furthermore, snowmelt for the PMF model was calculated external from the HEC-HMS and entered as a baseflow hydrograph. No calibration of snowmelt processes was required."

Why was this decision made to process the information this way, and what effect did this have on the model results?

A. MR. MENNINGER: Sure, I'd be happy to answer that, Mr. Chairman. This is John Menninger again.

So the options that you have here are to attempt to simulate snowmelt within a basin during a probable maximum flood, or alternatively, as we did, we utilized the historic snowmelt records and applied a conservative snowmelt process to the model.

When I mentioned incorporating the snowmelt processes, in order to simulate those within the probable maximum flood situation, we would have to be making a range of speculative assumptions: Air

temperature -- let's see here -- solar radiation, wind speeds, and other elements that contribute to snowmelt during a rain fall event.

It was a much more reliable and repeatable process from our perspective in order to estimate the run-off based off of historical snowmelt records and then apply that in conjunction with the probable maximum precipitation to produce the probable maximum flood.

Q. How does adding snowmelt as a base flow component change the peak flow characteristics?

A. MR. MENNINGER: It depends on how you add the baseflow.

So we added it in a -- we added it basically in addition to the rainfall run-off as calculated.

Q. If we could turn to PDF page 546, document manager, of Exhibit 173. The statement is made in the first paragraph that, and I quote: (as read)

"Calibration of the HEC-HMS model had limited success, which was due to the uncertainty of the hydrometric data at the Bragg Creek and Sarcee Bridge gauging stations. The partial aerial coverage and non-uniformity of rainfall used in the calibration also played a role in the calibration process."

Can you explain why calibration of the HEC-HMS model had limited success due to the uncertainty of the hydrometric data at Bragg Creek and Sarcee Bridge gauging stations? Can you explain that?

A. **MR. MENNINGER: I will attempt to. This is John Menninger again.**

I think we stated the reasons. We do present transparently in that report the comparison of the gauge stations to the -- to the calculated flow rates within it. I think we -- you can view on PDF pages 540, 541, 543, and 544 the comparison of the model runoff to the calculated gauge data.

The -- it is a model; I will just state that as well. Models have a purpose and a use. We were satisfied that the model was calibrated sufficiently to replicate the runoff processes of the Elbow River basin for use of calculation of a probable maximum flood.

Q. Now, this same sentence reads: (as read)

"The partial areal coverage of rainfall used in calibration also played a role in the calibration process."

Can you explain what is meant by partial areal coverage of the rainfall used and what role did it play in the calibration process? I'm not sure that I understand what you're getting at here.

So there's two parts, it seems to me, discussed the partial areal coverage of rainfall and the non-conformity of rainfall.

So I just wanted to look at the partial areal coverage first and what role did it play in the calibration process, if you could explain that.

A. **MR. MENNINGER: Sure. So the intent of that statement and the model has limitations. So you set up a model based off of a series of catchment areas that you apply uniform characteristics towards. Those basins or watersheds, if you will, would then in the future be applied design rainfall elements.**

The 2013 flood had a spacial distribution associated with it of rainfall that was applied to those watersheds.

It was a real storm that had a variable coverage, non-uniformity of rainfall, so some basins received more rain than others. The next flood that's a 200-year flood may have a different pattern and effect.

So what we're stating here simply is that we calibrated it to the data we had and applied it and then measured the success at two locations. So if rainfall falls slightly differently, it may produce potentially different results.

However, we did make educated adjustments to the

model and assign parameters based off of physical processes that were uniformly based across our model.

So, again, as I said, this model has a use and a purpose, and we feel that it was well suited for the calculation of probable maximum flow.

Q. So what is meant by "partial areal coverage"?

A. MR. MENNINGER: Just all I'm saying is that the rain was -- fell in different locations at different rates. That's all.

Q. So that doesn't go back to the fact that you only had hydrometric data from two gauging stations?

A. MR. MENNINGER: That sentence could have potentially been better constructed. This was six years ago. I will -- I don't believe -- I don't believe that it's referring to those two stations.

Q. Okay. And -- and then the -- it says: (as read)

"The non-uniformity of rainfall used in calibration also played a role in the calibration process."

Can you explain the non-conformity [verbatim] of rainfall used? Or maybe you already have. Maybe the two of them are together, I don't know.

A. MR. MENNINGER: "Non-uniformity," I think, is a term that we use, and that is stating that we're --

Q. I'm sorry, I should have said -- yeah, it is

non-uniformity -- it's not non-conformity. It is non-uniformity; right?

A. MR. MENNINGER: That's correct.

Q. Yeah, okay. Good.

A. MR. MENNINGER: So, again, this is John Menninger speaking. What we're saying there, non-uniformity of rainfall is simply that the -- a individual watershed element of our model may have not received a constant rainfall across that entire sub-basin in that it was in itself spatially distributed across that area differently than a uniform-applied average. That is all.

Q. So then do I understand, then that the partial areal coverage and non-uniformity of rainfall used was another reason why the calibration of the model had limited success?

A. MR. MENNINGER: I believe that's what we stated in the report.

Q. It just doesn't read that way. It just it says that: (as read)

> "The partial areal coverage and non-uniformity of rainfall used in calibration also played a role in the calibration process."

And I guess what I was wondering is what role did that

play and, you know, are you saying that that role resulted in some negative -- basically was a negative in the sense of resulting in the calibration of the HEC-HMS model having limited success?

I'm just trying to understand -- whoever wrote this, what they were trying to say. It's just not clear to me.

A. MR. MENNINGER: Yeah, I -- again, perhaps with an editorial touch, the sentence could be better crafted.

All it is simply saying is that models have limitations and that the calibration was based off of a highly varied rainfall pattern within the watershed -- or the 2013 event had a varied rainfall in the watershed and that we had specific areas assigned to our sub-basins, and that's the basis of it.

So all we're saying is that -- the somewhat -- that may have contributed slightly to some of the calibration.

Q. Who was involved in calibrating the model within Stantec, or did you farm that out?

A. MR. MENNINGER: I oversaw the calibration of it with a team of engineers that worked on the project.

Q. And were these all within the Stantec organization?

A. MR. MENNINGER: Let's see here. The -- we worked -- so on -- primarily. So the probable maximum

precipitation was performed by a subconsultant that is a meteorologist; the probable -- the snowmelt runoff elements, we worked with a contractor on that element of the snowmelt; but the -- primarily the rainfall runoff components were performed in the model that was done by Stantec employees.

Q. Do you agree that the statement made on PDF page 546 of Exhibit 173 in relation to the calibration of the model having limited success casts some doubt on the appropriateness of the model to project flood flows?

A. MR. MENNINGER: Can you repeat your question?

Q. Do you agree that the statement on page 546 of Exhibit 173, in particular that the calibration of the HEC-HMS model had limited success, that that casts doubt on the appropriateness of the model to project flood flows?

A. MR. MENNINGER: No, I don't believe it does. I believe the statement that said calibration was successful and adequately establishing the sub basin rainfall loss parameters in refining the channel routing parameters and then developing reasonable base flow simulation methodology provides our statement on the work.

As I said, it is a model. Models attempt to simplify complex physical processes, and are used,

then, to project potential alternate scenarios to replicate those processes. We feel like it was adequately established and built in order to perform those functions as needed for the design.

Q. So then you're saying that the NRCB and my clients can have faith in the model, even though Stantec writes that calibration of the model had limited success?

A. MR. MENNINGER: Yes, I believe so. And we've documented the -- the results of the model and have demonstrated that calibration.

The projected results of that rainfall runoff model fit well with the standards for probable maximum flood quantity for many other projects developed across Alberta in comparison of the peak flow to the drainage area. And so we do feel that this model is adequate and appropriate for its use in that function.

Q. But you could be wrong?

A. MR. MENNINGER: There is variability in the system, Mr. Secord. It is a model.

A. MR. WOOD: Mr. Chairman, if I may go back to an earlier statement -- this is Matt Wood -- an earlier statement I made about snowmelt.

While it is an important part of hydrological processes in most northern climate basins, and while snowmelt played a role of 12 percent of the total

runoff volume -- not peak, but runoff volume during the 2013 event, I do want to circle back on Exhibit 327, page 49, which shows that some of the largest snow packs in the basin produced the smallest flows. In fact, I'm looking at it here. I've seen two-year flood, five-year flood, and that seems to repeat across the board.

So while I'm not suggesting that it's not important, I think the emphasis on snowmelt may be a little bit misguided in the context of what we're talking about here.

Q. It was stated in Dr. Fennell's submission, Exhibit 261, PDF page 22, that -- and I don't know whether you want to turn this up, document host. It should be preloaded, yeah. 22.

He writes: (as read)

"Future IDF curves show a wide range of increased intensities, especially for storms of short durations less than one hour. Conversely, future IDF curves are expected to shift upward because of increased air temperature and precipitable water which are projected to be about 2.9 degrees Celsius and 29 percent in average by 2071 to 2100

respectively."

Now, much of the work on flooding has been done on past events. How have future expectations been incorporated into the hydrologic modelling to understand the likelihood of greater floods in the future?

A. MR. WOOD: **Mr. Chairman, this is Matt Wood here. I believe I mentioned this several times today that we used intensity duration frequency curves, as discussed here by Fennell, in the hydrologic model to estimate the potential impacts to flood frequency.**

Perhaps I can pass it over to Dave Luzi to provide a few more details with respect to what we're looking at here.

A. MR. LUZI: **Mr. Chairman, this is Dave Luzi speaking. I took a look at the reference where the graphs are coming from and the papers. Although they describe general kind of assumptions on climate change and the effects on stream flows, we have discussed earlier today, and mentioned a bunch of times, that there is more relevant research specific to our area that shows that we're not expected to see increase in peak flows experienced in Calgary from the Elbow River.**

Again, like, climate change has variable effects all over the world, and it's difficult to generalize those effects to specific regions where hydrologic

processes may differ.

Q. But from a worst-case scenario, wouldn't it be worth while attempting to do that, Dr. Luzi?

A. MR. WOOD: Mr. Chairman, it's Matt Wood. As I mentioned, what we were looking at when we did our modelling exercise, using IDF curves was a worst-case scenario. The scenario considered RCP8.5 out to 2050. That assumes no reduction in emissions from current practice.

Q. Yeah, but you used a -- you used an ensemble average of the climate model. You came up with 12 percent. You didn't look at the 95th percentile number, did you, Mr. Wood? So how is that a worst-case scenario?

A. MR. WOOD: Mr. Chairman, I'm not entirely sure of the question being asked, but I would add that it resulted in 12 percent increase, and the factor of safety for diversion rate is 25 percent. That's over double.

Q. Exhibit 345, the Calgary Water Security Report, indicates that droughts pose one of the greatest risks to the security of the City's water supply. And, as stated in the report on PDF page 22: (as read)

> "Climate change is likely to make extreme weather, including severe drought, more common."

It then goes on to say: (as read)

> "The risk of drought occurrence in the summer or early fall, in particular, when demand tends to peak, is likely to increase."

Now, Stantec states on PDF page 50 of Exhibit 327 -- this is in your Appendix G, and maybe we want to turn that up, document host? This is PDF page 50.

Stantec writes: (as read)

> "SR1 improves water security at Glenmore in any given year. It does this by allowing the City of Calgary to allocate more of the available storage in the reservoir to water supply in the spring. This means that the City will no longer need to draw down the Glenmore Reservoir to lower levels that they have been operating at in the spring and at risk that the flows don't materialize to fill it back up for supply."

Now, would you agree this logic is hard to follow because during an extreme and extended drought period, which has been noted in the tree-ring records, river flows will result in low water delivery to the Glenmore Reservoir anyway, so there will be no need to

drop the level; correct?

A. **MR. WOOD: Mr. Chairman, this is Matt Wood. I would completely disagree with this characterization.**

In a drought scenario, I would argue that it would be in the City's best interest to save every drop that they can in the reservoir and not lower it in anticipation of flood season. So, therefore, the water that comes in at snowmelt, they can hang onto it and not have to discharge it to lower the reservoir.

Q. And at the same time, the SR1 will not be put into operation as there will be no flood to mitigate.

So can you please clarify the logic behind the statement that SR1 will improve water security?

A. **MR. WOOD: Mr. Chairman, it's Matt Wood. I believe I've said this a few times, and this was echoed by Mr. Frigo from the City of Calgary, SR1 allows the City to operate within a more predictable range prior to flood season. They only need to allocate 10,000 dam cubes of active storage, no more, as is currently the case.**

And as I also stated earlier -- I believe I stated earlier, that SR1 does reduce the risk of flood damage at Glenmore. By mitigating flood risk on the Elbow River, it mitigates risk to that structure, and hence, a risk to the City's water supply.

Q. Now, the SR1 will contain water accumulated from snowmelt and rainfall events as well as major flood events. Do you agree that the water will likely contain nutrients entrained from the landscape, for example, animal wastes and will warm during the spring to fall seasons?

A. MR. WOOD: Mr. Chairman, it's Matt Wood. Perhaps Mr. Darrell Jobson would be best to answer that question.

A. MR. HEBERT: Mr. Chairman, sorry, Dave Brescia will take this question.

A. MR. BRESCIA: Thanks, Mr. Chairman. I'll start here and I'll get Mr. Jobson to supplement. This is Mr. Brescia.

So during a flood situation, the river would contain sediment which would have nutrients associated with it which would be carried down to the Glenmore Reservoir.

Q. And is there a risk of algal blooms including cyanobacteria?

A. MR. BRESCIA: One moment, Mr. Chair.

UNIDENTIFIED SPEAKER: Darrell, you're on mute.

A. MR. BRESCIA: So, Mr. Chairman, what I would state is that with the SR1 project in place, sediment would be transported into the reservoir, deposited in

the reservoir, and that would deposit, in association with that, a proportion -- a large proportion of the nutrients that would have been carried down to Glenmore had it not been in place.

Q. And would you agree that, once dried up, the cyanobacteria will remain on the fine particles at the base of the reservoir?

A. MR. JOBSON: Mr. Chairman, this is Darrell Jobson. I'd like to respond to that.

Cyanobacteria are not expected to be in the reservoir. It takes a few seasons for cyanobacteria to perfect conditions to stage for cyanobacteria to occur. We do not expect them to cause a bloom...

Q. I'm sorry, you kind of drifted out there.

COURT REPORTER: "We do not expect them to cause a bloom..."

Q. MR. SECORD: Mr. Jobson, you're -- you cut off.

A. MR. JOBSON: Okay. Sorry.

Q. We didn't get the whole -- I don't think we got all of your response.

A. MR. JOBSON: Can you hear me?

Q. Yeah.

A. MR. JOBSON: Okay. So what I was saying is that cyanobacteria are not expected to be an issue in the reservoir. Cyanobacteria are an issue in more

permanent reservoirs and lakes. It takes a few seasons for the stage to be set for cyanobacteria to bloom and be a problem. We do not expect that to occur in SR1 over the short time that water will be in the reservoir.

Q. Yeah, you don't expect it to occur, but is it possible that it could occur?

A. MR. JOBSON: The probability is highly unlikely.

Q. Okay. So cyanobacteria is not expected, but did you look at it?

A. MR. JOBSON: We assessed it.

Q. You did assess it. And where is the assessment of cyanobacteria in the record?

A. MR. JOBSON: It is in Exhibit 93, IR303.

Q. And specifically with respect to SR1?

A. MR. JOBSON: Yes.

Q. Okay. Now, projections are that the trend of global warming continues -- that as the trend of global warming continues, the risk of wildfires will increase. We've certainly seen that in western Canada over the last number of years. This will be exacerbated by insect infestations and associated tree-kills.

Do you agree that once an area is burned, runoff coefficients change due to lack of vegetation and the

creation of hydrophobic soils which leads to higher water yield and less soil retention?

Mr. Jobson, you're on mute.

THE CHAIR: Yes, muted there. Still muted.

A. MR. JOBSON: I'm sorry, Mr. Chairman. My space bar seems to be in reverse here.

Sorry, Mr. Secord. Can you please repeat the question?

Q. MR. SECORD: Sure. We were talking about wildfires increasing as a result of global -- of climate change. This is exacerbated by insect infestations and associated tree kills.

Do you agree that once an area is burned, runoff coefficients change due to the lack of vegetation and the creation of hydrophobic soils which leads to higher water yield and less soil retention?

A. MR. WOOD: Mr. Chairman, this is Matt Wood. All those things that Mr. Secord is suggesting are possible with changes in a watershed. It can the change hydrology.

Q. Now, most of the upper watershed of the Elbow River is forested and subject to fire risk, yet it does not appear this has been assessed for its implication to flood flows, associated water quality, impacts to Calgary 's water supplies, and the suitability of SR1

to successfully mitigate a flood event larger than 2013. Why was this aspect not considered?

A. MR. WOOD: Mr. Chairman, I'll repeat again that SR1 can accommodate floods larger than 2013 using that 25 percent extra diversion capacity and 10 percent volume.

I would also like to reiterate that the purpose of SR1 is to not mitigate water quality issues within the basin.

Q. So I guess my question was most of the upper watershed of the Elbow River is forested and is subject to fire risk. Why was this aspect not considered?

A. MR. WOOD: Mr. Chairman, wildfire is controlled I think to the best of that authority's ability within the basin. While it is a risk, this is the kind of thing that factors of safety are utilized for.

Q. Okay. If we could shift gears now to hydrogeology groundwater modelling?

THE CHAIR: Mr. Secord.

MR. SECORD: Yes.

THE CHAIR: Sorry to interrupt. If you're going to get another exhibit, then please do request. If not and if you don't need this one --

MR. SECORD: I don't.

THE CHAIR: -- just let the document manager know. And it's not really for our benefit; it's on the YouTube side, if we're not using a document, essentially they see mostly a document up maybe that nobody is referring to.

So it's just to make it a little bit more of a better experience for YouTube users, but your call. Thank you.

MR. SECORD: Sure, no. Please take the document down. Thank you. And it's better for me because I can see who's speaking better as well, so...

THE CHAIR: True enough.

MR. SECORD: And I can see someone's lips moving when they're not being heard, so that also helps.

Q. MR. SECORD: So we're shifting to hydrogeology, groundwater modelling, water quality, and chemistry, geochemistry.

Stantec calls into question the cross-section that Dr. Fennell used in his submission, Exhibit 261, PDF page 5. Maybe we should pull that up, sorry, with my apologies to the YouTube viewers. And, unfortunately, we will be looking at quite a few exhibits in this section of my cross-examination.

THE CHAIR: All good, Mr. Secord.

Q. MR. SECORD: So Stantec calls into question the cross-section that Dr. Fennell used in his submission, Exhibit 261, PDF page 5, showing the presence of sand and gravel deposits in the surficial sediments and underlying glacial deposits.

Stantec went on to say in Exhibit 327, PDF page 44, top paragraph that they are: (as read)

"Not present in the study area. This has been confirmed through the drilling of more than 150 project-specific boreholes within the PDA."

So if we can, you can confirm that's what was written in Exhibit 327, PDF page 44, or do we need to pull that up?

A. MR. YOSHISAKA: No, I can confirm that that's what is said in that Exhibit. I would like to point out -- sorry, Mr. Chairman, this is Dan Yoshisaka speaking. I would like to actually discuss this cross-section B-B, B-B prime that is shown here in the exhibit.

Q. Can we enlarge that a little bit?

A. MR. YOSHISAKA: Actually, that would be helpful, thank you.

Q. And all we need is the cross-section, Zoom host, so you can probably get it up to 150 maybe.

A. MR. YOSHISAKA: I think that's great, yeah.

Q. Maybe one more, one more, that's beautiful. So you're talking about B on the left-hand access and B prime on the right?

A. MR. YOSHISAKA: That's correct, yes.

So what is noted here in this cross-section in regard to units that are perhaps more permeable, two units are identified here in the cross-section: One is a surficial gravel denoted Gg, and this is the small red blob that's right at the ground surface. The second of which denoted Cs is the Calgary formation fluvial channel sand.

So I will note that in this section, that channel sand is located within the lacustrine unit, so it is a sub-unit of the lacustrine clay unit. And, again, that fluvial channel gravel, as noted on the section, is located right at ground surface.

So as we move to our response to this cross-section, yes, I can confirm that these two units are not present within the PDA.

Q. So, let's turn, document host, to Exhibit 327, PDF page 44. And it states on that page that the presence of sand and gravel deposits are not present in the study area; correct?

A. MR. YOSHISAKA: Mr. Chairman, if I could actually scroll down a few pages to page 51, I believe. And

this hopefully will help illustrate the location of cross-section B-B prime is shown on this figure.

So this figure adopts the mapping that was referenced in SCLG's evidence and simply overlays that over our maps of the project area. So it's a reproduction of that reference, geo-referenced in space relative to the project area.

What we can see here in this figure is that cross-section B-B is actually not situated within the PDA; it is situated east of the PDA by several miles. And, again, we confirm that the two permeable units identified on cross-section B-B are not present within the PDA.

Q. Okay. Document host, could you turn up Exhibit 159, PDF page 195.

If you could scroll down just below to the heading 10.3.6.2 and maybe bump it up to 150 for us. Thank you. Beautiful.

Now, I'm going to put it to you, Mr. Yoshisaka, that the statement by AT, Stantec in Exhibit 327, PDF page 44 that sand and gravel deposits are not present in the study area conflicts with the statement made by Stantec in Exhibit 159, PDF page 195, where they say just below the heading Section 10.3.6.2: (as read)

"The Unnamed Creek is an undersized

river valley in-filled with fluvial materials (sands and gravels) overlain by glacial till."

Can you explain the discrepancy that appears to contradict what Stantec wrote in Exhibit 327?

A. MR. BACK: This is Dan Back. I guess I can speak fairly clearly to we uncovered in our exploration. I think the difference here is this is probably a different formation than we were speaking about in that exhibit.

There is a gravel/cobble layer below the surface, it's not on the surface in a limited area immediately along Unnamed Creek. It is not a sand layer. It isn't consistent with those described previously in the exhibit, but it is a fluvial deposit consisting of gravel and cobble with minor sands along the Unnamed Creek.

Q. Document host, could you turn up Exhibit 178, PDF page 16, the third bullet on that page.

A. MR. YOSHISAKA: And, Mr. Chairman, I would like to add to Mr. Back's comments. The --

THE COURT REPORTER: Who's speaking, please? Who's speaking?

A. MR. YOSHISAKA: Sorry, this is Dan Yoshisaka speaking again. I would like to add to Mr. Back's

comments here.

The sand that's identified here and that is being spoken to here is a different sand unit than those identified in the Moran cross-section that Dr. Fennell presented.

So there is no stratigraphic equivalence between this sand unit and the two that are identified in that cross-section.

Again, the surficial gravel unit is located in that cross-section directly at ground surface. Second, the fluvial channel sand identified in that cross-section is a sub-unit of the lacustrine unit.

So this sand unit that has been identified in both of our studies, both the hydrogeologic side and the geotechnical side is a different sand unit. It is below the till unit and directly above bedrock.

So again, there is no stratigraphic equivalence between the sand units presented in the cross-section with the ones we're speaking to here.

Q. So are you familiar with Exhibit 178?

MR. BARBERO: Mr. Secord, is there something specific in the exhibit.

Q. I'm talking to Mr. Yoshisaka. Are you familiar with Exhibit 178? This is the -- I'm just getting my copy to load up so I can magnify it. This is the Stantec

Volume 4 of 4, Springbank Off-Stream Storage Project Preliminary Geotechnical Assessment Report Volume 4 of 4, dated December 8, 2020.

A. MR. YOSHISAKA: Mr. Chairman, yes, I'm familiar with portions of this document; not all of it pertains to my area of expertise. But for those areas that do overlap, yes, I'm familiar with it.

Q. And starting at page PDF 10 there's a heading "2.1, Soil Classifications." And I'm just trying to give you a little background.

And then at PDF page 16, so it's under that same heading. So if you could turn to PDF page 16, and if we could go to the third bullet, and if you could bump it up to about 200 so we can see it.

The third bullet says: (as read)

"Alluvial sand and gravel soils were encountered in the low-lying area of the Unnamed Creek near Station 23, plus 200 of the storage dam."

So is this the same -- the same discussion of sands and gravels that we looked at in Exhibit 159, PDF page 195?

A. MR. BACK: This is Dan Back. As one of the authors of this document, I can confirm that this is the formation that we were just speaking of in the Unnamed Creek, not the one that's in the Fennell

exhibit.

Q. Now, how has the presence of sands and gravels beneath the SR1 footprint in the Unnamed Creek valley been assessed for piping risk of water beneath the reservoir and the potential for reduction in geotechnical stability when the contention from Stantec is that these sands and gravels do not exist?

A. MR. YOSHISAKA: Mr. Chairman, I would just like to correct Mr. Secord in that we have in fact identified these sands and do acknowledge their existence.

What we are saying is that these sand are not the same sands that are identified in Dr. Fennell's cross-section. These sands again are below the till units; these are not sands within the overlying lacustrine unit. So there is, again, no stratigraphic equivalence between those two sands.

I'll invite Mr. Back to comment on how these sands were addressed in the design of the dam.

A. MR. BACK: Yes, this is Dan Back. We looked fairly extensively at the potential for seepage through this unit in the time when the dam is retaining the pool. A number of different seepages through the analyses were performed, and a specific system was developed to control all the seepage that might pass through this unit when there's water in the reservoir.

That should all be documented in the Preliminary Design Report in the geotechnical section.

Q. Document host, you can take down this exhibit. Thank you.

Now, what is a numerical groundwater flow model?

A. MR. YOSHISAKA: A numerical groundwater flow model is a mathematical description of the physical processes that govern groundwater flow in the subsurface.

Q. And who was responsible for setting up the model for this application?

A. MR. YOSHISAKA: I did oversee preparation of the model and it was conducted primarily by our numerical modelling team.

Q. And can you confirm that the numerical groundwater flow model was constructed with seven layers to align with the various types of glacial and bedrock deposits?

A. MR. YOSHISAKA: I, Mr. Chairman, would like to back up a little bit here in terms of our work flows in developing the numerical model.

The step preceding numeric modelling involved geologic modelling. So there's two steps to this work flow. The first is understanding the hydrogeologic framework of the study area, and that geologic modelling was conducted in a separate software suite

from the numerical modelling exercise.

Once complete within the geologic modelling, the output files from there were essentially handed off to the numerical modelling environment under which the numerical modelling of groundwater flow through those systems then proceeded.

So, in any case, you know, the geologic model which was developed, indeed, was based on thousands of borehole records across the regional assessment area, including the more than 150 borehole records which we installed as part of our field programs. And the geology interpretation that's derived in that model is based on multiple sources of information and is, indeed, reflective of the local geology.

So by taking the outputs from the geologic model and putting them directly into the numerical model, we know that the underlying structure, as was interpreted, remains intact within the numerical model as well.

Q. And how thick is each layer in the model? How thick is each of the seven layers?

A. MR. YOSHISAKA: They are all of variable thicknesses, again honouring the geologic interpretation derived in our geologic model.

Q. Are the thicknesses of the various layers based on actual field measurements or just estimated?

A. MR. YOSHISAKA: Mr. Chairman, if I could please direct you to --

Q. I'm going to be taking you to Exhibit 110, PDF page 113 in a minute because that shows the first layer of the -- Layer 1.

A. MR. YOSHISAKA: Actually, Mr. Chairman, if I could first bring your attention to Exhibit 110, page 27, please.

And, document manager, if you could please pull that up for us. And you will need to zoom out a little bit, please.

So what we are looking at here is a figure that depicts the regional assessment area that the -- both the geologic model and the numerical groundwater flow model both represent.

The dots that you see here, of which there's more than 2,000 across this area, are the locations where we yielded some geologic information that was then used to conduct our interpretation and inform the three-dimensional conceptual site model which is our geologic model of the area.

Now, if we could actually flip now to, within the same exhibit, page 27, please. My mistake, page 18, please.

So now this figure zooms in a little bit more. So

this is now focused in solely around the PDA, and this figure is now only depicting those holes that Stantec put in between our geotechnical and hydrogeologic field programs.

Again, you can see there's a very high degree of density around project infrastructure. So we have a very good handle on what the geology looks like, as well as, you know, boreholes distributed across the entire reservoir area and beyond as well. So we are very confident with the degree of coverage that we have in that we're well informed to conduct our geologic interpretations and, in turn, have -- yes, we have direct measurements of thicknesses of various units, their distribution and how those thicknesses vary over space.

Q. All right. And if we could turn up PDF page 113. And if we could put the Figure 4.5 in the middle and then maybe bump it up as much as you can, keeping the -- maybe one more so we can read the -- yeah, that's great, thank you.

Now, would you agree that much of the footprint of SR1 is underlain by lacustrine clay which has been given a K value of 5.1 times 10 to the minus 6 metres per second?

A. MR. YOSHISAKA: That is true for areas in the

reservoir area.

I would also note that there is a secondary low permeability layer underlying those lacustrine clays and then those would be the glacial tills as well.

So there's not only one layer; there's actually two low permeability layers under the reservoir area.

Q. In fact, it's been given a K value of 5.1 times 10 to the minus 6 metres per second in the X-Y direction and 5.1 times 10 to the minus 7 metres per second in the vertical direction. And that's shown in Table E-1 -- sorry, that's shown on Table E.1-2, Exhibit 110, PDF page 473. If we could turn there. Do I have that right?

A. MR. YOSHISAKA: Mr. Chairman, yes, that's correct.

I would also like to point out that these are calibrated figures. So these are figures based on -- which are constrained initially by our field measurements that we observed in the field and as well as observations during calibration.

So these are the values that we settled on. Again, they were selected to be quite conservative. And by conservative, in this case, I mean more permeable than what we anticipate based on our field measurements. By way of example, the clay unit here, the first row in this table, you can see connectivity

values in the orders of 10 to the minus 6s.

And, again, based on our field measurements, those values were, you know, more in the 10 to the minus 8s. Mr. Back's reports even values in the 10 to the minus 10 range. So the way we did parameterize this unit within the model is highly conservative.

Q. So if we could go back, document host, to PDF page 113. Perfect. Your sizing is excellent.

So, conversely, the model there, as provided in Exhibit 110 starting at PDF page 113, show the area where clay exists as having a K value of 7.2 times 10 to the minus 8 metres per second.

Do you agree that this is a notable inconsistency and will definitely reduce the water level effects and amount of leakage through the base of the reservoir when filled with water, and what is the explanation for this discrepancy?

A. **MR. YOSHISAKA: Mr. Chairman, I'm not sure that I quite follow Mr. Secord. I don't understand the nature of the discrepancy that he's pointing out here.**

Q. Right. Well, on this figure, 4-5, it shows the area where the clay exists as having a K value of 7.2 times 10 to the minus 8 metres per second; correct?

A. **MR. YOSHISAKA: So, Mr. Secord, you are referring here to the areas in purple which, indeed, have that**

value.

The area of the reservoir is actually the area in the more cyan colour there.

Q. I'm sorry, I'm obviously colour linguistically challenged. What colour are you referring to?

A. **MR. YOSHISAKA: The light blue with a bit of green colour there, which is actually assigned at the higher hydraulic conductivity value, as was noted in the table we previously referred to as 10 to the minus 6.**

Q. Okay. So this -- the first layer of the model that we see here in Figure 4-5, is that the project development area?

A. **MR. YOSHISAKA: So the project development area is -- yes, it is within this model domain area.**

The reservoir area is underlain by the lacustrine clays which are shown in this figure north of the Elbow River. The Elbow River, being the red feature running through the domain here, is shown as the lighter blue colour which, indeed, is assigned a value of 10 to the minus 6.

Q. So where in Figure 4-5 is the project area? What portion of this model there will cover the project area?

A. **MR. YOSHISAKA: Mr. Chairman, if you could bear with me here. I'm just going to find a better map that**

perhaps better represents those areas to make it a little more clearer. If you could just bear with me for a minute.

MR. SECORD: Mr. Chairman, could we take about a two-minute break? Is that agreeable?

THE CHAIR: Well, we're going to break around 3:00. Is this for a need to caucus or...

MR. SECORD: No, no, I don't need to caucus, sir. That's okay. I can wait until 3. That's fine.

I was going to say if he was going to take a couple of minutes, I would step away from my computer, but -- I might do that anyway if that's okay.

Are you ready, Mr. Yoshisaka?

A. MR. YOSHISAKA: Yes. I think so. If we could, please, refer to CEAA Conformity IR, Number 317. And I'm afraid this doesn't have an exhibit number. But page 47 of that document, I believe.

MS. FRIEND: Hello, this is Laura. If you could repeat the exhibit number, please.

A. MR. YOSHISAKA: I don't believe there is an exhibit number for this particular document. It's the CEAA Conformity IR responses, and it would be the response to Question Number 3-17.

MS. FRIEND: We won't be able to find it without an exhibit number. Like...

THE CHAIR: Well, or I mean if we had the date and title, we could probably get it and it could be entered perhaps as an exhibit. But we could find it that way, otherwise there are thousands of documents on the website. So our document manager person needs to zero in a little bit closer than that.

Is there a date? Did you get it off the web?

A. MR. YOSHISAKA: It would be CEAA Package 3, dated August 31st, 2018.

THE CHAIR: Tell you what. What might be better is, Mr. Secord, if there are some other questions you could continue on with for now. If not, then we're maybe in a bit of a bind unless -- if that's the only way to explain this, Mr. Yoshisaka, but otherwise we could get that after the break because then he could email it to our document manager and we could get it that way.

MR. SECORD: I can keep going, Mr. Chair.

THE CHAIR: Thank you.

Q. MR. SECORD: So we looked at Exhibit 110, PDF page 473, if we could turn that back up, please?

And we looked at the first -- the first hydrostratigraphic unit, the clay, and you --you know, we noted that the hydraulic conductivity is 5.1 times 10 to the minus 6 metres per second, and then for

something called the till north, it was 7.2 times 10 to the minus 8 metres per second.

Can you tell me what is the till north?

A. **MR. YOSHISAKA: The till north in this figure refers to certain zones of tills, as are defined within the numerical model. So till north specifically refers to tills north of Elbow River, again, which were parameterized with a value of 10 to the minus 8.**

Again, Mr. Chairman, members of the Panel, I will point out that the value of 10 to the minus 8 is, in itself, on the higher end of the range of what we observed in the field. So, again, we believe there's some conservatism built into this figure.

Q. And if we go back to PDF page 113. What colour is the till north in this -- in this Figure 4-5?

A. **MR. YOSHISAKA: So the till north in that figure would have been the deep purple regions.**

Q. 113. Right.

So my understanding, Mr. Yoshisaka, is that the clay is the purple and the till is what I would call a -- let's call it turquoise, it's close. Are you sure you're right that the till is purple?

A. **MR. YOSHISAKA: Yes, sir, I'm sure.**

A. **MR. BACK: This is Dan Back, the geotechnical engineer. Just to be clear, the till is also**

predominantly a low permeability clay. So both the lacustrine and the till are very similar in their hydraulic conductivity.

Q. Okay. Now, do you agree that the groundwater model does not include the presence of sands and gravels contained within the Unnamed Creek valley and is therefore incomplete with respect to modelling, or as accurately as possible, the local site conditions, and why was the decision made not to include these permeable deposits?

A. MR. YOSHISAKA: Mr. Chairman, members of the Panel, I would disagree with that statement wholeheartedly.

The permeable sands, which we are -- have been talking about are indeed included within the model. They are explicitly modelled as a unit within there. Again, they came straight from our geologic model which was first built and based upon the borehole records that we drilled in the area.

So, again, we know the extent of the sand unit. We know its thickness. We know how that varies over space, and indeed it has been included within the model and modelled explicitly as such.

Q. And where is the sand unit shown on Figure 4-5?

A. MR. YOSHISAKA: The sand unit will not be shown on

Figure 4-5 because Figure 4-5 is too shallow.

So in fact if we continue to scroll downwards on the page, document manager, please, and if we continue, and we continue yet; too far now. That's too far now, we need to go back up, please. I believe one more up. Sorry, I'm only seeing half a page at a time here.

It's Figure 4-9. If we could find Figure 4-9, it's just down a couple. Right there, thank you.

So the sand units which were identified and which, Mr. Secord, you pointed to in the geotechnical report are captured there. It's the green kind of polygon shapes there which represent those sands.

Q. Now, you're indicating deep sand? Or are we talking about the shallow sand at the surface? Because this is layer 4, and I would have thought layer 4 would be deep sand.

A. MR. YOSHISAKA: That's correct, Mr. Secord. So this sand is situated below the till; this is not sand at surface. And as we previously noted, there is no surficial gravel layer in -- in the project area. So this is sub-till sand.

Q. So this is not sand at the Unnamed Creek, is it?

A. MR. YOSHISAKA: That's not correct. This is sand at -- that is, in part, located at or underneath Unnamed Creek.

Q. Is that right, Mr. Back?
A. MR. BACK: Mr. Chairman, I'm not sure I totally understand the question.

As I stated before, in the Unnamed Creek, the sand/gravel/cobble layer is overlain by a clay formation. So there is a few stray boulders that lie along the creek for sure, but there is not a formation of sand and gravel and cobbles exposed on the surface.

THE CHAIR: Mr. Secord, Mr. Yoshisaka, I'm not sure if this helps at this point. But we apparently have been able to locate the document that you were referring to, Mr. Yoshisaka. If that is better now, then we can get it; if it isn't, then please continue.
A. MR. YOSHISAKA: Yes, it's very relevant for this. So if we could please bring that up, appreciate that.
THE CHAIR: And Laura, Ms. Friend, if we're going to be referring to it, if it isn't already entered as an exhibit, we should do that now.
MS. FRIEND: Okay. It would be Number 375.
MR. BARBERO: Mr. Chair, it's Michael Barbero here, sir.
THE CHAIR: Yes.
MR. BARBERO: Might I suggest we just confirm it is the right document before we mark it as the exhibit, sir?

THE CHAIR: Sounds good. Let's put it up, I mean at least the title, so we can confirm with Mr. Yoshisaka.

MS. FRIEND: This is Laura again. I just sent it to Carolyn, so she's been out of the loop. So give her a minute to catch up.

THE CHAIR: Okay.

MR. BARBERO: In the interest of time, it's Michael Barbero again, sir. Ms. Friend, I have just sent you an email with the exact link to the document, so you should have that as well.

MS. FRIEND: Thank you.

EXHIBIT 375 - 2019/12/10 ALBERTA TRANSPORTATION SIR TO AGENCY RE ANNEX 1 INFORMATION REQUEST ROUND 1 PART 3 CONFORMITY REVIEW DATED 2019/08/21 RESPONSE

MR. SECORD: Well, while we're waiting for that.

Q. Stantec indicates in Exhibit 327 at PDF page 44 that while Dr. Fennell is correct that the range of hydraulic conductivities measured were estimated through the completion of three in situ well response tests, several other attempts to measure the hydraulic conductivity values were attempted during the

hydrogeology field program.

Some of these test attempts were unsuccessful due to extremely slow water level recovery in the monitoring wells and lack of sufficient standing water in the well casing.

Can you direct us to where that is made clear in any of the application materials?

A. **MR. YOSHISAKA: Mr. Chairman, I don't believe that that is referred to anywhere else in the materials, the reason being is that the tests we did not consider to be successful because they could not be completed for the reasons that Mr. Secord just mentioned. As such, they were not reported.**

We do submit them in that response because in themselves, they do provide some qualitative support for the observations that the hydraulic conductivity values of those clay materials are very low.

In fact, if we cannot completely complete the test because the recoveries are so slow, that it can be inferred that the conductivity at those locations is in fact lower than where we completed the successful test.

Q. Do you agree that this does not diminish the fact that the properties of the glacial deposits are only constrained with a minimum number of K test readings, i.e., three, one of which has a calculated value of up

to 2.2 times 10 to the minus 7 metres per second, do you agree that this hardly frames the range of possible K values and seriously undermines the efficacy of the groundwater model?

A. MR. YOSHISAKA: Mr. Chairman, I would not agree with that statement.

They are correct in stating that there were three values yielded from the hydrogeology field program. However, if I could point you to Exhibit 175, please, and starting on page -- PDF page 101.

THE CHAIR: Just one moment, Mr. Yoshisaka, thanks. It's 175 at page 101; is that correct?

A. MR. YOSHISAKA: Beginning on 101, thank you. Thank you, document manager.

Mr. Chairman, as you can see here in this exhibit, starting in Section 5.4.3.6 are presented additional hydraulic conductivity testing results from the geotechnical testing program.

If we scroll down in this document here as well, please, this first table here, Table 11, is a summary of additional measurements that were taken. You can see they total an additional 14 measurements based on falling head tests.

In addition in Table 12, we have another four results based on CPT pore pressure dissipation tests.

Table 11 and 12 just pertain to the glacial lacustrine materials.

You can see from these tables that the K values are extremely low, ranging in the orders of 10 to the minus 10.

Now, if we continue downwards in this document, document manager. Thank you.

Table 13 and Table 14 also present additional K values from tests completed on the glacial tills. So here we have an additional seven measurements taken here from falling head permeability testing, as well as testing CPT pore pressure dissipation tests as well.

So in addition to the results that we yielded from the hydrogeologic field program, we also have available to us these results as well, both of which were considered in our models and in terms of how we characterized those values.

Again, what you can see from the majority of these values are measured values are much much lower, that what we eventually carried in our model which is again why -- why I'm quite confident that our model is conservatively set up and would tend to overestimate effects related to impoundment of water within the reservoir.

Q. Well, Mr. Yoshisaka, you are referring to lab tests

which are not the same as field measurements; correct?

A. MR. YOSHISAKA: They are not the same; I will agree with that. They are no less representative, however.

So tests are conducted under different conditions, and perhaps Mr. Back can hop in here. He can explain these much better than I.

A. MR. BACK: Yes, this is Dan Back.

Q. Just before Mr. Back comes to the rescue, Mr. Yoshisaka was the one who referred us to these lab tests.

Mr. Yoshisaka, field measurements give more accurate results in place, do they not?

A. MR. YOSHISAKA: That's not -- not the case necessarily, no. I wouldn't agree with that.

THE CHAIR: Mr. Secord, you're leaning back. It's very difficult to hear you.

MR. SECORD: Sorry.

Q. So you're saying that lab tests are more representative than actual tests taken in the field in place?

A. MR. BACK: If I could -- this is Dan Back. If I could address that perhaps.

Our goal as engineers and geotechnical engineers is to understand better what happens in the field. Always we're interested in what's going to happen at the project site when the facility is built, and we

used a lot of tools to get there.

Obviously field tests is one direct measurement of what's setting in the field. Unfortunately field tests have a lot of limitations. Another way to do that is laboratory tests, which are able to do a much more precise test under controlled conditions. Unfortunately, lab tests also have some drawbacks relative to sample disturbance and so forth.

So, typically, in understanding what's going to happen with the parameters relating to soil, in this case particularly the hydraulic conductivity, we use a mix of different test values to give us a best understanding.

Typically, you have a difference in horizontal and vertical permeabilities, and we often rely on the laboratory tests as giving us a better understanding of the vertical permeabilities because that's usually the way that we test the soil in the laboratory. Often we rely on the field measurements to give us a little better understanding of the horizontal permeabilities, and then we use empirical relationships between the two to give us a better understanding.

I would point out that in these tables that Mr. Yoshisaka showed you, there's both lab tests, the one that are currently in the screen, they're Table 13,

those are laboratory tests. Table 14 are CPT, pore pressure dissipation tests which are done in the field.

We had a significant -- how shall I say, we had a significant challenge with the field testing due to the extremely low permeability of the clay. I had it up here a minute ago, and it's probably not worth going there, but we did probably 30 different pore pressure dissipation tests, and because of the extremely low permeability, most of those were terminated before enough data was obtained to get a meaningful hydraulic conductivity from the soil. It simply takes such a long period of time to let the pressure equalize, which is what the field test is, to really establish a meaningful hydraulic conductivity.

In a laboratory and controlled condition, we can run the tests for longer, we can apply higher pressures and scale the tests to field conditions and get a lot better confidence in what the numbers are telling us.

Q. Then why do field tests at all, Mr. Back?

A. MR. BACK: Again, you want to use as much data as you can and correlate those data with each other.

In the empirical relationships, the field scale is important. We had some discussion earlier about large scale fractures. The field tests might find those when

the laboratory tests would not.

Sometimes you have differing materials and layers in the field that you might not pick up in a small laboratory sample.

So all in all you want to rely on both sources of information to give you the best understanding of how the sub-surface will respond.

Q. Okay. So if we could go back to Exhibit 110, PDF page 113, 113, the first layer. Document manager, you're doing a superb job, thank you.

So, Mr. Yoshisaka, you have the -- you totally have the configuration of Layer 1 wrong for the K value and the presence of sand and gravel; correct?

A. MR. YOSHISAKA: No, that's not correct. There is no sand and gravel at ground surface as we've previously mentioned. So there is nothing that's wrong with this.

Q. I thought there was at the Unnamed Creek?

A. MR. YOSHISAKA: No. Again, Mr. Secord, I'll refresh your memory that that sand in question is below -- below the till. It is not at ground surface.

Q. The sand and the gravel at the Unnamed Creek --

A. MR. YOSHISAKA: That's correct.

Q. -- is not in Layer 1. And what's the thickness of Layer 1?

A. MR. YOSHISAKA: It's -- it's variable.

Q. So the area of the Unnamed Creek, what is the thickness of Layer 1?

A. MR. YOSHISAKA: I'm not sure I totally answer or understand your question.

I mean Layer 1 is built based on the topographic surface, so it follows the contour of the land, you know, what you see here is a plain representation of that, so you can't see the topography here. But Layer 1 is the uppermost layer in the model that is constrained at the top by the digital elevation model for the area.

So the surface topography is -- and all of its variability is captured in Layer 1 in the model.

Q. Okay. So let's go to Layer 2. Where is the sand in Layer 2?

A. MR. YOSHISAKA: The sand will not be present in Layer 2.

Perhaps I could go to -- if we could refer within Exhibit 110, just bear with me and I'll find a better figure here for us to refer to.

Q. And while you're doing that, what is the total thickness of the seven layers that was used for the model? What depth does it go down to in metres? Is that described anywhere?

A. MR. HEBERT: Mr. Chairman, we'll just take a moment, and we'll ensure we have the right information and be able to proceed with answering Mr. Secord's questions.

THE CHAIR: Thank you.

MR. SECORD: Mr. Chair, if it's okay with you, can we take our break early, come back at --

THE CHAIR: Mr. Yoshisaka, we could also then, if you could please confirm -- document manager will put up a document and for Mr. Barbero's request, you can confirm that that is for sure the document that you want. Let's do that before break, please.

Ms. Taylor, do you have that document handy?

MS. TAYLOR: Yes, we do.

THE CHAIR: Would you put it up, please, just so we can get that confirmed so when we come back, we'll have it ready to go?

MR. BARBERO: Document manager, it's Michael Barbero of Alberta Transportation. I think we're looking for PDF page 42.

THE CHAIR: And is this the correct document? Or you will know that by page 42, I suppose, will you?

A. MR. YOSHISAKA: Yes, I believe so. If we could actually scroll down a couple of pages to page 47, and I'm hoping that's the map that I'm -- there's a table,

yes, and then continue on down.

Yes, these would be the figures that I was going to point to.

THE CHAIR: Okay. So this document, then, Ms. Friend, can be, let's ensure this is the one, ensure this is document we enter as Exhibit -- sorry, the number again, the previous number?

MS. FRIEND: 375.

THE CHAIR: 375. Thank you. Okay. And panel, it is close to 3, it's 10 to 3. So Mr. Secord, if you're going to need a bit of a caucus, anyway...

MR. SECORD: No, I don't need a caucus at all.

THE CHAIR: You just need a break.

MR. SECORD: I just want a break, sir.

THE CHAIR: You need a break, well, we've finally got you.

Okay, so let's turn at five minutes after 3, then, everyone, thank you.

(ADJOURNMENT)

THE CHAIR: Okay. Panel, is the panel ready, and Mr. Secord, are you ready?

MR. SECORD: I am, thank you.

Q. So if we could turn to Exhibit 110, PDF page 47. And Mr. Yoshisaka, you took me to this figure earlier, and if we look at the -- I don't think you need to zoom in,

Document host, but I can tell you that in the left-hand side there is a figure which says: (as read)

"Glacial lacustrine isopach thickness in metres."

And it's a blue line. And can you confirm that most of the SR1 reservoir area appears to have this glacial lacustrine isopach; correct?

A. **MR. YOSHISAKA: That's correct, Mr. Secord. The reservoir area is underlain by the lacustrine deposits as noted there.**

Q. And that would be clay; correct?

A. **MR. YOSHISAKA: Low permeability clay, that's correct.**

Q. And then if we go to PDF page 113, and we look at Layer 1 -- and while we're at it, I'm still waiting for an answer on the thickness of the seven layers.

A. **MR. YOSHISAKA: Sure, if we could pull up the other document that we were searching for.**

Q. I want to just stay here for a second before we go to the other document. So do you have an answer for me on the thickness of the seven layers?

A. **MR. YOSHISAKA: It's variable, and the other figure that I'm trying to address will highlight that.**

Q. Okay. Well, then, let's go there.

So this is Exhibit 375, PDF 101 -- or, sorry, this

is the new exhibit, Ms. Friend?

THE CHAIR: Ms. Taylor, this is Exhibit 375?

MS. FRIEND: This is Laura. Yeah, that was the right one. It doesn't show 375 on her copy yet, so -- but it was the 2019 document.

THE CHAIR: Thank you.

Q. MR. SECORD: Okay, over to you, Mr. Yoshisaka.

A. MR. YOSHISAKA: Thank you, Mr. Secord, Mr. Chairman, actually, document manager, if you could scroll down just a couple of pages here. Actually one back up just so we understand what we're looking at here. Thank you.

Yeah, I'm just going to present a cross-section A-A, which you can see there in "Plan View," and if we scroll down now to the next page, this is cross-section A-A, and this is a vertical slice through the model domain. So this is a cross-section that depicts the various layers in the model, and, you know, their varying thickness.

Now, the sand in question that we were talking about earlier is now shown near the right side of the cross-section here. It's that magenta colour there. You can see that it's underneath the till units in this location and, in fact, in all locations, and resides directly above bedrock.

Q. And that's towards the A prime side of the Figure 17-2?
A. MR. YOSHISAKA: That's correct, yeah.

Also, Mr. Secord, you had a question about the overall thickness of the model. It is shown here. As you can see, it depends on where you are in the model because there is so much topographic change that's going on across the model domain, so ultimate thickness does vary.

But, ultimately, the bottom let's say of the model is approximately at an elevation of 1,024 metres above sea level. So, roughly, it's about 200 metres thick.

Q. And so the magenta that we see in towards A prime, that would be how many -- how many metres would it be below the surface before you encounter the sand and gravel or the sand unit?
A. MR. YOSHISAKA: Again, at -- it is variable across the project area at which depth it is encountered. This particular section is near the diversion channel area, actually.

So, at this particular location, it's a little bit shallower than it can be found in other locations. And again, its thickness varies from about a metre. I think, at thickest, it's approximately 7 metres thick.

Q. I think the document I took you to earlier indicated there was a sand unit that was 7 metres or so in depth,

and would it be -- and then the -- what is the sort of light grey above the sand unit?

I guess there's -- first of all, there's a blue layer and then what unit is the blue layer above the sand unit? A thin blue layer it looks like.

A. **MR. YOSHISAKA: So the blue layer directly above the sand layer is the till, and the units on top at ground surface is the lacustrine clay.**

Q. And then document host, if you could just zoom up so we can see the legend on the right-hand side a little better. A little bit more. That's great. If you can slide it over.

So as I look at this, the sand unit would be first encountered just a -- well, I guess just a little bit below -- 1216 metres above sea level; correct?

A. **MR. YOSHISAKA: That's correct, yes.**

Q. And then there would be a very infinitesimal amount of till, so basically we're looking at something like between the top of the clay, which would be at -- actually, it looks like the top of the clay would be at 1216 metres above sea level, and then you would have within the next 8-metre segment, you would have, I guess, maybe 3 metres of clay, a thin -- maybe a metre of till, and then you would get about 3 metres of sand. Does that work as you go from 12 16 to 12 08; we're

talking about an 8-metre interval there?

A. MR. YOSHISAKA: Approximately.

Q. Thank you. Is there anything else you wanted to take a look at in this document?

A. MR. YOSHISAKA: Not in this document, I believe. There's some other cross-sections in the TDR update that I could present as well.

It will also highlight the distribution of that sand unit which we again will well understand.

And then again, I can present some other cross-sections that will show you its position stratigraphically below the till.

Q. Now this cross-section A-A prime is not under the SR1 reservoir footprint, so how is this relevant?

A. MR. YOSHISAKA: This just happens to be a location that I knew had handy that did in fact show the presence of that sand. I believe the assertation being put forth at the time was that the sand was not incorporated into the model.

So I'm bringing this to your attention, Mr. Chairman, so that you know that it is in fact included within the model.

Q. So if we look at that map that you pulled up earlier, can you direct us to that which shows where the A-A prime --

A. MR. YOSHISAKA: It's just -- just above this particular figure, I think. It's one page up.

Q. So A-A prime is not in the project area?

A. MR. YOSHISAKA: A-A prime is within the project area; it just cuts across the diversion channel area.

So if you'd like to see some conditions under the reservoir area, I could point you to a different figure that would describe that. Document manager, if you could pull up Exhibit 110, and if we could move to PDF page 55 of that document, please.

So this figure here is a figure again showing some cross-section locations cut across the PDA. And if we look at cross-section A-A prime in this here which is oriented in a northwest to southeast direction and basically follows the low point down the main axis of the reservoir. So that's the location of cross-section A-A.

And if we now move down one page, so this is now the cross-section itself.

There are two parts to this figure. The upper cross-section is the entire cross-section A-A. So if you recall, it spans the entire regional assessment area. The bottom cross-section you see there is actually a zoomed-in portion of the cross-section shown above that is zoomed in specifically in the PDA of the

project area.

So here in this section, you can see the lacustrine clay shown in brown at ground surface. Below them in green are the tills, and the lower sand unit which is beneath the till is barely visible there, and that's really how thin it is relative to some of these other units.

If you look kind of in the central area of that cross-section just to the left of Elbow River, you can see a very thin deposit there in yellow.

Perhaps, document manager, if you could zoom in a little bit, maybe a little bit more.

Yeah, so if you look just left of the Elbow River in that lower cross-section, you can see a thin yellow unit there, and that is that lower sand unit that's represented there within the model.

And, again, you can see there relative to the thickness of the overlying clays and tills, it's relatively thin, it's relatively isolated in its extent, but despite that, we acknowledge its presence and it is modelled within our models.

Q. Right. In Exhibit 110 and PDF page 127, Stantec reports on results of the residual head calculations to assess for any systemic bias in the groundwater model. What is systemic bias?

A. MR. YOSHISAKA: Systemic bias would be referring to -- you know, in this case we were examining calibration residuals and these are basically the difference between a modelled and observed result.

In this particular figure, Figure 4-15 that we're looking at here, plots the value of the residual relative to the elevation of the groundwater level. So you can see that residuals fall above and below the zero line so the zero line in this case would be a perfect fit between a modelled and observed value. And you can see here that -- the distribution of the residuals.

So systemic bias would be indicated by the majority of the points either falling far above that zero line or the majority of points falling below that zero line, or there could be cases where there's clustering of dots in certain regions of the model as indicated by the elevation shown there that, you know, could lead you to suspect that there is some overall bias in those residuals.

Q. And how does systemic bias arise in numerical groundwater models?

A. MR. YOSHISAKA: I mean, it is one of the metrics through which we assess successive calibration. So, again, really a residual is just comparing what the

model value is versus an observed value. And, yes, as you are calibrating your model, one of the metrics that you are trying to optimize are those residuals.

Q. Now, on this page, Stantec goes on to say in the second paragraph on PDF 127, and I quote: (as read)

> "The plot indicates that the residuals are distributed both above and below the zero line, again indicating no systemic bias in the calibration."

Do you agree that when assessing the actual residual values presented in Table 4.1 starting on page PDF 123, the results are not consistent with this conclusion?

If we could go up to PDF 123? Do you agree that out of the 72 residual values provided, 42 or almost 60 percent are above the zero line?

A. **MR. YOSHISAKA: Subject to check -- I have not run those numbers myself, but yes, I could accept, I believe in your evidence it was stated that 58 percent were above the zero line.**

Q. Can you confirm that Figure 4-14 on PDF page 121 of Exhibit 110 also shows the location of calibrated targets used and range of residual values as shown by coloured dots?

A. **MR. YOSHISAKA: Yes, I can confirm that.**

Q. Do you agree that, although it would have been more

helpful to show the actual values at each point, there does appear to be some bias towards more positive residuals on the east side of the SR1 footprint?

A. **MR. YOSHISAKA: I would agree that, spatially speaking, some of the resids [verbatim] on the east side of the domain are more positive than those values in the PDA area.**

Mr. Chairman, I would like to point out that when we are calibrating a model of this nature, this is a large regional scale model. What we are most interested in in calibrating is the area where the effects are likely to start.

So, you know, in calibrating the model, we definitely focus on that area first because that's the areas where there's change in stressors in the system, and those stressors in this case being, you know, the impoundment of water behind the dam.

So first and foremost, we want to optimize the calibrations in those areas first, and then recognizing that, yes, in some areas, distal to those main area of effects, the calibration may not quite be as strong.

I would also like to point you to another figure in Exhibit 110, and this figure just precedes the plot that we just had up. It's Figure 4-14, please, document manager, on page 126. Thank you.

So this is another plot of the same residuals. So this graph, basically examines the residuals in a different way.

What you can see here in this is the red dotted line that goes across this graph at a 45-degree angle there and represents the line of perfect fit. So dots that fall on that line, the simulated and observed groundwater levels have a very good match.

Again, you can see from this plot that the residuals all plot very close to the line of perfect fit. Yes, there is some scatter in the data and that is certainly expected of a regional scale model. But what we see here, as well, is that the fit of those residuals is quite good across the entire range of values in the model as well.

So we need to keep in mind that this is a regional scale model in an area of high topographic relief. There's more than 200 metres of relief in this model from its highest point to its lowest point.

So, you know, residuals that are, you know, averaging a couple of metres within the framework of a model that has over 200 metres of relief are actually quite small. And if we actually scroll up one more page, I believe, we can see in Table 4-2 there some of the residual statistics based on the calibration, the

correlation coefficient notably at the bottom there being .99, which is actually a relatively high level of correlation for those residuals, and the normalized root mean squared residual is 2.8 percent there, you know, common metric for the adequate calibration of a model of this nature would be in the order of 10 percent.

So it's a rather good calibration of this model. Again, there's going to be some variations in the residuals and where they are, but overall we have confidence that this model is adequately calibrated.

Q. So going back, zoom host, to PDF page 121. I had -- you confirmed that Figure 4-14 shows the location of calibration targets used and the range of residual values shown by coloured dots. You agree that it would have been more helpful to show the actual values at each point, and you agree that there does appear to be some bias towards more positive residuals on the east side of the SR1 footprint.

How is this considered unbiased? And how does it speak to areas of the model domain that are not appropriately configured?

A. MR. YOSHISAKA: Mr. Chairman, I believe I said that I acknowledged the residuals in some eastern areas of the model are higher than those in the main areas of

influence, namely within the project PDA.

I don't see overall, at a model scale, that there is systemic bias. So there is no, you know, broad pattern of all the residuals being positive or all the residuals being negative. Again, yes, there is some variation and they do swing from negative to positive, which, in fact, means that it's pretty close.

When you have residuals that are close to zero and, yes, some are positive and some are negative, then that means that your calibration has honed in in the right area.

Q. Zoom host, you can take that down. Thank you.

Now Stantec indicates in Exhibit 327, PDF page 45 that -- and I quote: (as read)

"Effects on pore pressures were, in fact, examined under the most conservative scenario where the complete external loading due to the weight of water impounded in the reservoir was applied directly to the underlying bedrock, assuming that none of this external load would be borne by the overlying clay tills."

How is it possible that none of the external load will be carried by the clay tills when that is the actual

material that the SR1 reservoir will sit on?

A. **MR. YOSHISAKA: Mr. Chairman, I believe the passage that Mr. Secord referred to was in reference to how we modelled the effect of an external load applied to the ground surface, how those loads would translate into pressures within the underlying bedrock aquifer.**

So we are saying here that this is what we hit was a conservative approach because we took the entire load that would be related to the impoundment of water, so the so-called weight of the water on the land surface, was applied as an additional head to the underlying bedrock.

So Mr. Secord is correct in saying that, in reality, you know, that wouldn't happen. Yes, the clay tills and the underlying materials would, in fact, bear some of that load.

But for conservatism, we did not -- you know, we assumed that none of the load would be carried by those materials because that, in turn, overestimates the pressure effect in the underlying bedrock.

So this was a conservative approach and, in reality, some of that load would be borne by the overlying materials which would actually reduce the pore pressures underneath because, again, the portion of that normal stress that has now been applied is just

borne by the matrix itself and not the pore fluid.

So our approach in this case, when examining the effects on groundwater, was to adopt something, you know, entirely conservative in that we were not discounting any of that loading that's actually borne by the matrix itself, and we apply that directly to groundwater assuming that it's got to take it all.

Q. What about the pore pressures in the clay and tills?

A. MR. YOSHISAKA: So, again, we embarked on that exercise because the question at the time was being what will happen to water levels within the bedrock due to the weight of water impounded in the reservoir, and you know, how far out could the pressure effects in bedrock be observed, what would their magnitude be, and with that in mind, I mean that was the question we were seeking to answer. And, again, to do that, we applied that full load of additional head directly to the bedrock. So we feel, again, that's a highly conservative approach, would tend to overestimate the pressure influence within the bedrock, but it is informative for us in terms of developing our monitoring and mitigation plans.

Q. If the impact of applying the full external load onto clay tills had been applied in the model, how would this change the results of the assessment and what

would the risk of failure be like in those circumstances?

A. MR. YOSHISAKA: Mr. Chairman, I think we are talking here about slightly different issues.

So our approach to assess effects on the groundwater system assumed that that load would translate as pressure down to the underlying aquifer. So our assessment on the groundwater system was not intended to assess the effect of that additional load in terms of a geomechanical response of those underlying tills. That assessment was conducted by our geotechnical teams, and was also duly considered, but it is a separate assessment than the effects assessment for groundwater.

Q. Yeah, you understand my question is not about the bedrock?

A. MR. BACK: This is Dan Back. Do I need to address that question, Mr. Secord, as far as the geotechnical stability analysis relative to pore pressures?

Q. Yeah, I'm just trying to understand Mr. Yoshisaka's response.

A. MR. BACK: He was modelling pore pressures in the bedrock, so that's why he allowed the load to pass through the soil formations directly to the bedrock.

If you're interested in the performance of the soil formations, we looked at that in great detail in our geotechnical records.

Q. That was my question. I referred to Exhibit 327, PDF page 45, which said that the weight of the water was applied directly to the underlying bedrock.

And my question to Mr. Yoshisaka was how is it possible that none of the external load will be carried by the clay tills when that is the actual material that the SR1 reservoir will sit on. And I had a long explanation.

But my -- I guess the question that I have is, if the impact of applying the full external load onto clay tills had been applied in the model, the groundwater numerical model, how would this change the results of the assessment?

A. MR. YOSHISAKA: So Mr. Chairman, we're talking about different models here.

So the groundwater model was developed to assess effects on groundwater levels, pressures, flow regime, and so forth. There is a separate modelling exercise that has been completed as well to address the geotechnical concerns that Mr. Secord has raised here.

So they are two separate models, and we shouldn't, you know, mix them up here in our discussion.

The text, Mr. Secord, that you're referring to was specific to the groundwater model. So for a groundwater modelling perspective, that approach is conservative because we're taking all the pressure and we're putting it in the groundwater system. So we're overestimating the effects on the underlying aquifer.

It is not meant to reproduce conditions accurately within the tills for the purposes of a geotechnical assessment. That line of investigation was handled by our geotechnical teams, and Mr. Back can comment more on those.

Q. Okay. I think I'm more interested in the groundwater numerical model at the moment. So Mr. Back, we'll leave you out of it for the moment.

In Exhibit 327, the last paragraph on PDF page 44 indicates: (as read)

"Stantec acknowledges that the Spy Hill formation contains notable concentrations of montmorillonite which indeed does swell when hydrated."

It is noted that -- and I quote: (as read)

"Because water levels in the clay tills in the SR1 reservoir area are in general near ground surface, these units are continuously hydrated with water in

their existing state, and thus the potential for a formation of large scale desiccation fractures beneath the shallow water table is minimal."

Do you agree that while this may be true, so long as they stay hydrated, what happens when an extended drought occurs and the water table declines?

A. MR. YOSHISAKA: Mr. Chairman, as we've stated before, we do acknowledge that when clays dry out, there's a potential for them to -- to form these desiccation fractures.

However, should the project be put into operation and then these fractures are present, you know, once the water starts percolating down, I mean those clay materials will swell again, and those fractures will anneal.

Q. Do you agree, and I don't know whether this might be for Mr. Back, do you agree that the fact that the montmorillonite is hydrated is a concern given that it has a tendency to share slip when placed under external load?

A. MR. BACK: Yeah, this is Dan Back. I guess I need to address that.

Montmorillonite is a clay mineral. It's a component of many clays that occur. Based on the

plasticity of the clays, particularly, the lacustrine clay, we would believe that a significant component of that is montmorillonite. There's other clay minerals that are in the clay, and usually the performance of the clay depends on the combination of the proportions of those within it. We would expect changes in the performance of the clay soil, depending on the moisture content that was present.

The way that the text in that report is written, it implies that the clay exists in an unhydrated condition; that's not accurate. Both the till and the lacustrine clay are currently moist. They're saturated to a depth of somewhere between 1 and 3 metres below the surface, and then they're in a moist condition from there to the surface.

In the event of an extensive drought, there would be some drying near the surface. Again, as I stated earlier, we -- I don't see any evidence based on the condition of the soil currently of that drying extending deeper than a couple of metres below the surface.

When clay soil is totally dried out and has no -- no or very little moisture in it, it becomes very hard. Think of like adobe brick or something; right? And so it has a great deal of strength. Its strength

performance is dominated by the cracks that might form in the adobe block, if you will.

But when it is hydrated and has water content above the shrinkage limits, certainly above the plastic limits, it has a different set of characteristics, and it has softening kind of as implied there. The strength of the soil is probably not going to vary that much once it is in a moderately hydrated condition.

What happens when we have loading on the structure, and that could come from the construction of an embankment; it could also come from loading from the reservoir water loading, the pore water within the clay -- well, maybe I should back up.

The clay is subject to some shrinkage, consolidation, settlement, whatever word you want to apply, due to the vertical load that's applied to it. And as that occurs, the voids within the soil, that'll be the spaces that don't have soil particles, tend to get squeezed or reduce in volume.

And if there's enough water, in this case, in the clay is saturated and those voids are full of water, the water will not compress.

And so the load is carried by the water, and so that reduces the effect of normal load on the soil material, and that reduces the effect of sheer strength

that you can achieve in that soil.

So let's just say we were to build the embankment and the soil underneath was saturated, then we would end up with high pore pressures. Those high pore pressures would reduce the normal load that pass through the foundation soil, and that would result in an apparent reduction in strength. Sheer strength cohesion is the term that Fennell used.

And so yes, we anticipated in our analysis, we went through a number of fairly sophisticated laboratory tests with a lot of different conditions on the soil samples to try to understand more clearly how the soil would respond under different normal loading and different shear loading and different pore pressures so that we could reasonably well predict how it would perform.

And we had some interaction with other engineers, both within Stantec and the technical review board retained by Alberta Transportation to look at our analysis, and as a result, we actually ended up doing a very sophisticated fine element model to help us understand what the pore pressures might be depending on how quickly the embankment was constructed.

So if you notice in the Preliminary Design Report, there's an extensive discussion about both traditional

empirical methods of analysis and fine element analysis methodologies of understanding the strength of the soil under the embankment due to the loading that's based upon it.

So I don't know if that answers your question directly. Perhaps you could restate your question or add another question for me.

Q. Okay. Let's add another question.

So hydrated soiling clays can slip; correct?

A. MR. BACK: I would take your term "slip" to mean a sheer failure, sheer movement, sheer displacement?

Q. Sure.

A. MR. BACK: Yes, depending on the loading that's applied to them, that can happen, yes, it can.

Q. So how is this risk incorporated into the geotechnical assessment and how can my clients who are in the Springbank community who are going to be immediately downstream of the structure, within metres downstream of the structure, in fact there's one resident just at the end of the Unnamed Creek where the low-level outlet flows into, how can they be confident that the degree of sampling and lack of mineralogy to substantiate local conditions beneath SR1 is enough to provide comfort that a rather unique dam structure will not be

subject to catastrophic failure at some point in time?

A. MR. BACK: Well, just to be clear, our goal is to develop a design that will not have a catastrophic failure. We'll incorporate redundancies into the design and do the analysis in such a way to essentially rule out that as a possibility.

As far as the shear slip I think is the terminology that you applied there, the way that the soil works is it slips or shears on the plain like that when the shear strength is exceeded.

So you take a sample, and you apply a load to, and it fails on a shear plain.

So the goal of our laboratory tests and geotechnical analysis was to understand what the shear stress is within the soil, both in the embankment and the foundation underneath, will be during the construction and operation and various conditions both failing during a flood, seismic conditions, drawing down the pool after the flood, all the different conditions is to understand what the shear stresses will be here in the soil.

And the laboratory testing program is to help us understand what point will the soil exceed the strength that it has speak and begin the shear slip that we speak of.

So our entire design is based on doing those computations and understanding at what point the shear slip will occur and making sure that we never get close to that value. The factors of safety that we use in our geotechnical analysis allow us to have a difference between the strength of the soil to resist the shear slip and the loading that would cause the shear slip.

Q. Did you test any of the intervals between the interfaces between the clay till and bedrock for slippage risk?

A. MR. BACK: We evaluated all of the materials from the ground surface to within the bedrock. We looked specifically at what was likely to be occurring at the top of rock location. We looked at what was going on in the interfaces between the lacustrine clay and the clay till. And our conclusion was that those interfaces would be -- the strength of those interfaces would be dominated by the weaker of the materials at the interface.

So if we're looking at the clay till versus the lacustrine clay, the lacustrine clay is typically less strong, so the strength of the lacustrine clay would drive the performance of that interface.

If we look at the clay -- the clay till and the underlying bedrock, the clay till was less strong than

the bedrock, and so the strength of that clay till would drive the strength of the interface.

Q. So you didn't test any of the intervals at the interfaces between the clay till and bedrock for slippage risk?

A. MR. BACK: I guess I could answer that positively yes, we did not. And it's not traditional in geotechnical engineering practice obtain samples that are testable that would have a portion of soil and a portion of rock and then try to test the interface.

I can tell you from my experience in laboratory testing, when you do that, your shear will be in the soil.

There was some discussion of mud stone layers within the bedrock and some concern about the strength of those. However, in our extensive drilling program, we came to the conclusion that if those did in fact occur at the interface, they were over limited extents because of the dipping nature of the bedrock formation. And so there might be a little bit of mud and stone for a few metres, and then there would be more sandstone.

So to have a failure, we'd have to have a relatively large area many metres long that would actually move, and so you would get a composite of whatever the strength might be in the mud stone

location and in the sandstone locations.

So our very confident belief is that any failure that occurs along the top rock interface will occur at the strength of the glacial clay too.

Q. Now, in Exhibit 178, starting at page PDF 325, there are a number of figures that show the depth of possible slope stability issues extending down into the clay tills underlying the SR1 dam structure.

And maybe we could pull up Exhibit -- sorry, PDF page 409 of Exhibit 178. Perfect. Maybe you could just reduce it by one. Thank you, zoom host.

Do you agree that this raises the risk of failure within the glacial units themselves or at the interface between the clay and underlying till, and how has this risk been assessed in relation to increased pore pressures from external loading that may serve to reduce friction and increase shear slip in the lateral direction? And a good example of this is on PDF page 409, which we have in front of us now.

A. **MR. BACK: I'm sure I don't follow your question, and it's awfully complex with a lot of parts. Could you state it again or perhaps break it into smaller pieces so I could answer each one.**

Q. Sure. So taking a look at this figure on PDF page -- at 409 of Exhibit 178, can you describe what the black

vertical lines show?

A. MR. BACK: Yes, I can. I'm very familiar with this figure and all of the figures that you're referring to here.

Q. So can you just take me through what this figure is depicting in terms of this incipient motion in the downstream direction?

A. MR. BACK: Yes, absolutely. This is a GeoStudio analysis for slope stability, and you're seeing the section that we analyzed. This is one of the sections of the embankment dam. This particular case, as it says there, "Load Case End, Construction Year 3, Flood, Total Stress Parameters."

So the layers that you see starting from the bottom, the orange yellow colour is the bedrock; the purple is the glacial clay till; the bright red is the lacustrine clay; and then above that, we have the embankment. The blue is the core, the grey is the shelves, the brown are the rock toes. And then over on the left, you see kind of the dark crosshatch and that would be the pool because this is an assumed flood condition.

There is, as you see there, a somewhat irregular sort of partially circular surface that starts up at the crest in the blue, sends down through the bright

red and comes down at the downstream toe. That is the failure surface for this particular analysis.

The vertical lines that you see in there, I believe those are slices the GeoStudio generates that it does its computation of the slope stability on. Up above that, you see a red dot and, beside that, the number 1.4.

The way this works is we set the model up and we identify the geometry of the layers as in here. We identify the properties of the layers, you see that in the table above, unit weight, cohesion, different friction parameters, and then we identify what failures we want to look at.

In this case, we're talking about a downstream motion. The incipient means its going downstream if it moves and when it moves. We did another one -- maybe on the flood gates we did another one. Most of them we did both downstream and upstream.

Then you give the program certain restraints. In this case, we have an entry and exit restraint. You see the little kind of dashed red lines on the surface of the crest of the dam and down at the toe, and then you give it some search parameters and tell it to start looking and it does hundreds or thousands of different computations of different potential movement surfaces,

circles, and then non-circular surfaces. It changes the nodes around and it keeps doing a calculation of the factor of safety until it lands on the least factor of safety, the one that gives us the most likely, if you will, probability of movement.

In this case it landed on the least value as 1.4. The resistance of the soil from the shear slip is 1.4 times the loading that's being applied to the soil along that specific surface right there.

Perhaps you could ask another question or tell me what I haven't clarified for you.

Q. Sure. Can you confirm that the risk assessment for geotechnical stability has been limited to the dam and diversion channel only?

A. MR. BACK: I'm not sure I would use the term "risk assessment." The seepage and stability analyses was primarily focused on the embankment dam and the little saddle dam and sections of the channel. Excuse me.

I believe there were some slope stability analyses done on the reservoir rim and also along the bank of the Elbow River in addition to those that were most concentrated on the embankment dam and the channel.

There were other geotechnical evaluations of other elements, but the primary geotechnical analysis focused

on the embankment data in the channel.

Q. And how has the risk of shear slip underneath the rest of the reservoir been assessed, including the additional pore pressure that will occur when the reservoir is full of water?

A. MR. BACK: Well, as I indicated, some stability sections were performed on what we called "reservoir rim." We looked at areas around the reservoir where the existing topography is steepest where we'd be most likely to have some failures.

I would point out that the loading from the reservoir water is going to be laced with the least amount of water on the edges, the loading from the reservoir is going to be greatest at the bottom, in fact right next to the dam where it's 20 metres deep or whatever. And in those locations, there's not really very much shear stress applied to the soil; it's mostly just compressive stress because there's really no place for the soil to go to, there's no outlet.

Like, you look at this figure here. The soil that might move would exit to the right side or the downslope side. If you're in the bottom of the reservoir, there's no place for the soil to exit to.

Q. So when we look at this figure, "Load Case End, Construction, Year 3, Flood, Total Stress Parameters,

Incipient Motion in the Downstream Direction," this shows a slippage risk at the clay till interface; correct?

A. MR. BACK: Clay till interface with what?

Q. With the reservoir. Where is the clay in this picture?

A. MR. BACK: Well, the clay till is the purple and the lacustrine clay is the bright red. And this is --

Q. So does this show a slippage risk at the clay till interface?

A. MR. BACK: So, I'm sorry. You're referring to the lacustrine clay and the till as till.

What you see here is the search. When GeoStudio is doing that slope stability search, it finds different circles, right?

And there was probably some circles that went down to the bedrock and it said, oh, no, that's really resistant because of the high strength. They had some that were shallower and they had high factors of safety because the driving load was less, so it landed on the critical surface.

And you'll notice what happened there is the bottom of that thinner circle searched downward until it hit the till which is the purple, and it decided it didn't want to go into the till because the till was

stronger.

So it found the maximum circle that was still in the weaker lacustrine layer and that's where it came up with the minimum factor of safety for shear slippage to occur.

Q. And that factor was 1.4?

A. MR. BACK: That's correct.

Q. Were there any factors of safety less than 1 for the dam embankment that were run by Stantec?

A. MR. BACK: I would have to go back through and see. We have different criteria for different conditions. I believe this particular condition had a 1.3 criteria for the long term, we have a 1.5. For the pseudostatic, we looked at 1.0. For the flood condition, we looked at a couple of different, long-term conditions -- so I'm not into construction -- one was 1.2, one was 1.4.

So, at the end, we adapted the design until it achieved those target factors of safety according to CDA and other references to meet the requirements based on the analysis that we did.

Q. Zoom host, could you go to PDF page 423?

A. MR. BACK: Thank you.

Q. This figure has a factor safety of .07; correct?

A. MR. BACK: That is correct.

Q. That would be below the Canadian Dam Safety Guidelines?
A. MR. BACK: Yes and no. What happens is there's not a -- there's not a criteria for pseudostatic factor of safety. What there is is there's a trigger that says if the pseudostatic factor of safety is less than 1.0, which this one is, then it's incumbent on the designer to do a deformation analysis to establish what would happen during the earthquake, and that's what we did on this section.
Q. Now, the estimate of leakage from the reservoir has been provided. And if we could turn to Exhibit 110, PDF page 151. Stantec indicates that, and I quote: (as read)

> "An estimate of seepage out of the reservoir area when full, and just prior to commencement of release (when seepage rates out of the reservoir area would be at their maximum) was obtained through examination of the flux values at each of the nodes within the reservoir, summation of the net fluxes yielded an estimated seepage rate of 425 cubic metres per day out of the reservoir."

Would you agree that this is based on having a much lower clay value for the clay layer of 7.2 times 10 to

the minus 8 metres per second rather than the 5.1 times 10 to the minus 6 metres per second reported in Table E.1-2, Exhibit 110, PDF page 473 that we looked at earlier?

So just to recap, because there was maybe a little bit to that, Mr. Yoshisaka, I read to you the sentence from PDF page 151 of Exhibit 110, which indicated that the seepage rate was going to be -- was estimated to be 426 cubic metres per day out of the reservoir.

So the first part of the question, this is based on having a much lower K value for the clay layer of 7.2 times 10 to the minus 8 rather than the 5.1 times 10 to the minus 6 metres per second reported in Table E.1-2.

A. **MR. YOSHISAKA: No, that's not correct. The values -- so this estimate of flux came from the model. Again, as was indicated here, it's based on, you know, selecting the model nodes that are wet when the reservoir is full, and summing the flux values for each of those nodes across the entire wooded area of the reservoir. Now, the underlying hydraulic conductivity conditions are those that be carried in the model.**

So, yes, there's a value for the clay. There's a different value for the till, as was the case in all the simulations that we ran.

Q. How would increasing the K value to 5.1 times 10 to the

minus 6 metres per second impact the leakage rate from the reservoir?

A. **MR. YOSHISAKA: It would not. These values are based on that conductivity value.**

Q. If the model is not set up correctly, how can you get an accurate leakage rate?

A. **MR. YOSHISAKA: We believe that the model is set up correctly and thus have confidence in the seepage rate that we've estimated.**

Further, Mr. Chairman, I mean if there is question around the hydraulic conductivity values that we carried in the model, we did endeavor to undertake some sensitivity analysis simulations, again, where we turned up the permeability of some of these units by a factor of up to 1,000.

So, again, we made some of these units more permeable by a factor of 1,000 to evaluate, you know, what -- the what-if scenario, what if these materials are more permeable than we think, what are the outcomes.

Based on those simulations, yes, we see further propagation of effects and higher magnitude effects, but, in general, those effects are still limited to the local assessment area.

So they are relatively local in scale despite

turning up conductivity values far in excess of what we ever observed in the field.

Q. So in terms of your sensitivity analysis, what was the highest K value you looked at to impact the leakage rate?

A. MR. YOSHISAKA: I believe we multiplied the K values of those till deposits by a factor of 1000.

Q. So what are we looking at in terms of 10 to the minus what?

A. MR. YOSHISAKA: Approximately 5, 10 to the minus 5.

Q. Okay. Now, Stantec did conduct some baseline groundwater analyses for the SR1 area; is that correct?

A. MR. YOSHISAKA: That's correct.

Q. And is it correct it did not go further in terms of assessing the chemical information of the groundwater analyses?

A. MR. YOSHISAKA: So we completed a baseline monitoring event that covered all of the monitoring wells which we installed as part of the hydrogeologic field program. So each of those wells was sampled. We collected water samples from them and submitted them to the lab for analysis of a rather broad suite of parameters.

Through that analysis, we feel that we are -- have

very well-constrained baseline conditions for the project area.

Q. Sorry to go back, Mr. Yoshisaka, but you indicated that you increased the K value to 10 to the minus 5. How did that impact the leakage rate? When you went from 7.2 times 10 to the minus 8 to, you know, let's say 5 times 10 to the minus 5 metres per second, how did that change the estimated seepage rate?

A. MR. YOSHISAKA: I don't believe that we presented that number. Again, that sensitivity run, you know, the main intent was to understand okay, if these materials are more permeable than we believe, how far away could those effects extend. You know, how might that change the groundwater flow patterns within that area relative to the case that we carried in the effects assessment, yeah, and to understand, you know, what -- how our characterization of some of those effects might change as a result of that.

So we did not specifically recalculate the seepage rate on those values and in part because those values are so high now, I mean they're essentially non-credible in terms of what our observations are. Basically we turned clays into sands, and we just know that that's not -- not the case.

So we did that effort, again, to see how far the

effects on the flow regime could extend outwards, and that again gives us an idea of the area of effect that could be the case should these materials be much more permeable.

Q. Is there some reason why you didn't present the sensitivity analysis using the increased K value?

A. MR. YOSHISAKA: We did present those results.

Q. But it doesn't translate to the seepage rate under the reservoir? I'm just trying to understand your answer. I don't know that I got it or follow it.

A. MR. YOSHISAKA: No, I don't believe we recalculated the seepage rate.

Again, we feel that the rate that we have is already conservative because, even outside of the sensitivity analysis, the model that we carry in our effects assessment, again, assigns a K value of 10 to the minus 6 for the clay, which is already at least one order, if not two orders of magnitude higher than our observations.

So we feel there's sufficient conservatism in that seepage estimate already.

You know, I would also like to point out that, you know, the incremental head associated with the impoundment of water behind the dam, you'll hear numbers of 24 metres of head being drawn out there, and

that is accurate. But it's important to keep in mind that the area over which there is an incremental 24 metres of head is actually quite small. I mean it's quite limited to the upstream toe of the dam.

As soon as you progress in the northeasterly, sorry, northwesterly direction basin, those incremental pressures become much, much less.

So, you know, in actual averaging over the entire area of the reservoir, the incremental head is nowhere near 24 metres. It's probably closer to around 12.

Q. Now, Stantec did some baseline groundwater analyses for the SR1 area as I discussed a moment ago, but did not go any further with assessing this chemical information.

Can you tell me, how is it possible to determine that the effects of SR1 will be not significant as indicated in paragraph 3 under Concern Number 2 of Stantec's Exhibit 327, PDF page 45, when Stantec has done no geochemical modelling or feet in transport assessment to substantiate that claim?

A. **MR. YOSHISAKA: In terms of the feet and transport modelling, Mr. Chairman, I'd like to point out that, you know, when we construct a groundwater flow model, we are modelling the flow of groundwater through -- through the system.**

Now in terms of, you know, entrainment and subsequent transport of potential contaminates, we can conservatively estimate that in the absence explicit feet transport modelling, if we assume that the contaminants will move through -- effectively with groundwater that.

And again, this is a conservative approach. When you actually endeavor on a more detailed feet transport modelling of contaminants, the additional terms that you're adding to your flow equations really have to do with mechanisms that slow the transport of contaminants. So things like, you know, hydrodynamic dispersion, absorption, those types of processes would be additional terms that you would include within your mathematical formulation of the flow system.

So by not doing that, you're essentially assuming that contaminants move effectively with groundwater, and in turn, it arrives at a conservative approach.

So if we simply assume that a contaminant will move at the same rate as groundwater, even though we know in reality that's generally not the case, contaminants move slower than the average speed of groundwater because of these other processes that happen. But again, conservatively one could assume that they just do move at the same time rate as

groundwater, and thus estimating your flow velocities and extent of influence serves as a conservative surrogate for the areas of effects that you might expect for contaminants as well.

Q. Did you do any particular work to look at this for SR1, or are you just speculating?

A. MR. YOSHISAKA: Again, we use the groundwater flow model that we created to also assess the potential for migration of contaminants. A contaminant cannot move any quicker than the groundwater moves. A contaminant could only in reality move slower, aside from some, you know, perhaps scenarios that really aren't applicable to what we're looking at here.

So, again by assuming simply that contaminants would move at the same rate as groundwater, it is a conservative approach and would tend to overestimate the rate at which they would migrate to the subsurface.

Q. Stantec states at Exhibit 327, PDF page 46, paragraph 1, of Concern Number 3, that: (as read)

"In general -- "

You can take this down, Zoom host: (as read)

"In general, average TDS concentrations within the upper bedrock are lower than average TDS concentrations in the unconsolidated clay/tills."

Do you agree that a review of the difference in TDS values between the bedrock and the clays/tills using a non-parametric sign test does not substantiate this claim?

A. **MR. YOSHISAKA: I think our claim is simply this, is that the average TDS concentrations within the upper unconsolidated materials is -- is, on average, a little bit higher than the average TDS concentrations in the underlying bedrock.**

Q. How did Stantec arrive at the conclusion that the TDS values are from different populations, and how does this information change their opinion of hydrochemical connectivity between the clay tills and the bedrock?

A. **MR. YOSHISAKA: Mr. Chairman, in our baseline assessment, we provide that text that again states that the average TDS concentrations in those upper deposits is slightly higher than those found in the bedrock.**

And then why we highlight this is because if you can imagine a groundwater flow path, as that flow path and residence time through the system increases, groundwater tends to become more mineralized. So the higher TDS will prevail when the flow path through the system is longer.

So when you consider that TDS values in an underlying formation are lower than those in an

overlying formation, the manner in which that can come about is because the transit time through the system in that lower unit is shorter than it is in the overlying sediments, so meaning that the bedrock system is being -- as is the upper unconfined sediments, but its travel time through the system in bedrock is likely a little bit shorter in time, and thus, we have some evidence that, you know, all of the water in the bedrock is not percolating through the upper materials.

If that were the case, then the TDS values in the bedrock would at least be the same or even higher than those within the unconsolidated deposits.

So, really, we're not, you know, offering that evidence to suggest that, you know, there's necessarily a stark contrast between these TDS values, but it is evidence to suggest, again, that water in the bedrock is derived from its recharge areas, which we know are in the more upland areas of the region, and that water that's slowly migrating through the upper sediments is not the sole contributor to the water that's found in bedrock. And that's the point we're trying to make there.

Q. You understand that my question here is are the datasets distinct from one another or not; right? You understood that was the point of my question?

A. MR. YOSHISAKA: Yes, we categorize the hydrochemical results into bedrock results and results for the unconsolidated deposits so they are separate datasets.

Q. And in this case, I put it to you that there is no significant difference between the TDS and the clay tills versus the bedrock?

A. MR. YOSHISAKA: Again what we've presented in evidence, and though I've not conducted the same statistical test that Dr. Fennell has presented, but it was a simple comparison of averages in one group with the averages in another group.

Q. Okay. Zoom host, if we could have Exhibit 110, PDF page 141. Thank you.

Now, in Exhibit 110, PDF page 141, this figure shows the simulated net change in head for the PPXO/EEXO scenario; correct?

A. MR. YOSHISAKA: That's correct.

Q. And an area drawdown of up to 8.5 metres is noted along the diversion channel leading from the Elbow River to the SR1 reservoir and up 2.5 metres above 500 metres or so out from the channel in certain areas. Do you agree with that?

A. MR. YOSHISAKA: That's correct.

Q. And what is not shown is a drawdown influence for the

outlet channel leaving from SR1 -- leaving from the SR1 reservoir to the Elbow River; correct?

A. **MR. YOSHISAKA: That's correct.**

Q. And this channel is -- appears to be in the order of 9 metres deep in areas where the water table is close to the surface, i.e. less than 1 to 2 metres, and perhaps, Zoom host, you could turn to Figure 3-23 on PDF page 75.

Can you please explain why there's no drawdown projected for the outlet channel when the excavation will be below the water table?

A. **MR. YOSHISAKA: I believe the outlet channel in that area is relatively -- the excavated portion of the outlet channel is a relatively small feature. It's probably also relatively close to where the -- the Unnamed Creek is as well.**

Q. Can we go back to PDF page 141? So what are you referring to there, Mr. Yoshisaka?

A. **MR. YOSHISAKA: So Mr. Chairman, the outlet channel is situated quite close to the natural channel of Unnamed Creek. Within that creek, I mean there is some hydraulic control exerted by the creek as well because in the model we have the creek feature modelled as constant head conditions.**

So we have water coming into the model from the

creek itself as well, which tends to, again, with our model, elevate water levels in those areas because there's modelled inflow entering the system.

Q. If we could turn up Exhibit 110, PDF page 479.

Now, under sensitivity analysis scenario 3 of the groundwater model where the simulated net change in hydraulic head for the PPX0, this is baseline after construction with no floodwater and the EEX0 baseline pre-construction are compared in a steady state mode as if SR1 was permanently filled, based on this assessment, do you agree there are indications that head values could increase by up to 24 metres beneath the dam itself and up to 6 metres within about 500 metres of the dam, and from .6 to 3 metres up to 2 kilometres to the west and east of SR1?

A. MR. YOSHISAKA: Mr. Chairman, this figure here was a sensitivity analysis run for a series of simulations run on our former model domain. Over the course of this process, we have updated the model since then, including the sensitivity analysis scenario. So I would actually refer you to Exhibit 157, starting on about page 9, I believe, document manager.

Yes. Thank you.

So this is the updated sensitivity analysis that was run on the most recent and current version of the

model. It does depict largely the same picture that you showed there in the previous version, Mr. Secord.

Yes, we will acknowledge that changes in head can extend outwards from the project development area, and, yes, they -- at their maximum near the upstream toe of the dam, can be found at levels of up to 24 metres.

But what you will note as well when you examine this figure is that the deeper red colours are higher increases in head and as they grade into the oranges and yellows and finally to the blue-ish hues, the incremental head is decreasing.

So the area of 24 metres of head is that thin sliver on the upstream toe of the dam, and it grades down in terms of incremental pressure from there.

But yes, we do acknowledge that, under this conservative sensitivity analysis, that, you know, there could be effects that extend beyond the PDA; however, they are contained within the LAA, and the LAA is an area that extends approximately 1 kilometre beyond the boundary of the PDA.

Mr. Chairman, I'd also like to put some context around these sensitivity runs. It's important to keep in mind here that this sensitivity run represents us keeping water in the reservoir indefinitely. So this is a simulation of what could happen to the pressures

when (a) the hydraulic conductivity values are turned up to more permeable levels than what we observed, and in addition, we are now holding water within the reservoir indefinitely, which is obviously not an operational case.

So this exercise was meant to (a) evaluate the robustness of our model but also understand some worst-case scenarios of what could happen should that unrealistic operating scenario come to pass.

And, yes, you do see some effects, again, extending a little bit beyond the PDA but not really at levels that are -- that would cause a problem or that would be at levels that we couldn't mitigate with the proposed mitigation measures that we have presented.

MR. BARBERO: Mr. Chairman, it's Michael Barbero speaking sir.

THE CHAIR: Yes.

MR. BARBERO: Mr. Secord, my apologies to interrupt. It's just -- I note this was a document that I spoke to in my opening because I believe there's a revised version of this figure and document that we had intended to put in. I just thought I would ensure that we are not looking at the old version of this document when, in fact, there's a new one.

MR. SECORD: Well, maybe, Mr. Barbero, you can

fire me an email after we break today and let me know -- and if you wish to confer with your team, I realize they're under cross-examination but you have my permission to sort this out and let us know. Is that agreeable?

A. **MR. YOSHISAKA: Mr. Chairman, I can speak to that. This is the figure that we identified that we needed to file an errata regarding this figure. Again, there's nothing wrong with the modelled results here that are presented. The error shows up in the legend to this figure where the bins describing those colour ranges there in this version are not correct.**

MR. SECORD: Okay. Thank you.

Q. So in terms of -- so if, for instance, the City of Calgary was desperate for water and said to Alberta Transportation, we want this -- we want you to store water in this structure, this would be the type of scenario that you would see in the event that water was stored in the reservoir for a longer period of time than contemplated. Do I understand that to be correct, Mr. Yoshisaka?

A. **MR. YOSHISAKA: You do, Mr. Secord, and it's not a longer period of time; it's indefinitely. So this simulation is run in a steady state mode which, you know, refers to what happens if you hold the water in**

the reservoir and you let -- you hold it forever, and somehow you actually maintain water levels in the reservoir as well. So, in reality, you would have to be continually adding water to the reservoir just to keep it at those levels -- but hold it there until the system re-equiborates (phonetic) to its next equilibrium.

Q. And if the SR1 reservoir was to contain water for a longer period of time for any reason, how would this affect the flushing of the contaminants from the clay tills into the bedrock?

A. MR. WOOD: Mr. Chairman, this is Matt Wood. I would just like to make it very clear to the Board that the purpose of SR1 is not to hold water in this manner. This analysis was not done at the request of the City of Calgary and the project's purpose is not to hold water.

The analysis is done to show that the area under the reservoir is relatively impermeable, and even if you were to hold water for this period of time, the effects are limited in nature as you can see here.

Q. So my question, I think, Mr. Yoshisaka was if the SR1 reservoir was to contain water for a longer period of time for any reason, how would this affect the flushing of contaminants from the clay tills into the bedrock?

A. MR. YOSHISAKA: I would say, in general, not appreciably. I mean, the difference between this figure and the version that we carried within the effects assessment are really not that different. I mean, what you see here is an extension of the areas of blue slightly beyond the PDA, where as in the effects assessment, they are contained within it.

So, you know, the zone of influence is extended, you know, outwards. It's not far enough that it really would present any difficulties to the mitigation plans that are contemplated.

So, in fact, you know, the monitoring plan that we have developed, considered -- considered this. So the location of the wells that we're proposing, the depths of the wells that we're proposing, contemplate these types of changes in the system and thus are positioned strategically in those locations to detect that change. And should that change come to pass, we can implement further mitigation at that time.

Q. Document manager, if you could pull up Exhibit 110, PDF page 94.

In this Table 3-4, it provides a number of sample locations and for the parameters, selenium and uranium, you'll notice on this page, 94, a number of these units are highlighted with, I'm going to use the colour

orange. Does that work for you, Mr. Yoshisaka?
A. **MR. YOSHISAKA: Yes, indeed. Thank you.**
Q. And then if we go to PDF page 95. In this same table again, we see -- sorry, page 96. Again, we see highlighted -- units highlighted in orange for uranium and selenium; correct?
A. **MR. YOSHISAKA: That's correct. There's a couple of instances highlighted there, as you've noted.**
Q. And then on page 97, it indicates in the orange area, it indicates that the concentration exceeds the indicated standard.
A. **MR. YOSHISAKA: That's correct.**
Q. And for -- and for selenium and uranium, it appeared to me that the standard was Alberta -- was tabled to "Alberta Tier 1: Groundwater Remediation Guidelines, Agricultural Fine." Do I have that right?
A. **MR. YOSHISAKA: Document manager, if you could scroll up for me, please.**

So, yes, if you see those exceedance values that are highlighted in orange, the superscript there is D.

Q. I see. I see one that is C as well, right, for uranium. I missed that one when I was looking at it yesterday. Oh, and there's also -- yeah, C, so that would be on page 96. That would be -- sorry, page 97, that would be Guidelines for Canadian Drinking Water

Quality Maximum Acceptable Concentration. Do I have that right?

A. MR. YOSHISAKA: That's correct.

Q. And what is this Alberta -- "Table 2: Alberta Tier 1, Groundwater Remediation Guidelines Agricultural Fine." What does the "fine" relate to?

A. MR. YOSHISAKA: The fine relates to a texture of the sediments in question. So the Alberta Tier 1 guidelines will have separate tables for coarse materials and separate tables for fine materials.

Q. Okay. So we can confirm, then, that there are elevated concentrations of selenium and uranium in the groundwater within the clay till deposits inside the PDA.

Do you agree this is an indication that these harmful elements can and have been mobilized under natural conditions?

A. MR. YOSHISAKA: I would agree that, given the mineralogy of these clays, that the original source of those dissolved constituents are -- it's certainly feasible that they came from the sediments themselves.

Q. And do you agree there is both physical water level responses and chemical major ion compositions evidence that the groundwaters in the clay tills and the upper bedrock are connected. However, there has been no

assessment of how flushing of selenium, uranium, or any other contaminants that may accumulate in the SR1 reservoir water and sediments may impact the groundwater that local residents rely on for themselves and their livestock?

A. MR. YOSHISAKA: Mr. Chairman, I wouldn't agree with the statement. We do, in fact, recognize in our effects assessment that there is potential for some changes in groundwater quality in the reservoir area. It is something that we do acknowledge and characterize within the effects assessment, and we do also contemplate that in the design of our monitoring program.

So, again, we have a robust monitoring program that has been established to monitor for these types of effects. And in so monitoring them, we would then implement further mitigation measures should they be required for the short-term duration that the water will be impounded within the reservoir area.

Q. Now, do you agree that although Stantec and AT has said that the groundwater flow may be to the south and southeast of the project area, pumping of water wells near the reservoir may intercept and capture some of the water?

A. MR. YOSHISAKA: The effects of intermittent

pumping of domestic wells would already be captured in the baseline conditions that we have characterized.

So we acknowledge that yes, wells have an influence on water levels, and the pumping of wells tends to locally depress those levels, but those conditions are captured within our understanding of the baseline conditions as they are today.

Q. So you're saying that your groundwater numerical model captures these events. Is that what you're saying?

A. MR. YOSHISAKA: What I'm saying is that the water levels to which we have calibrated the model already reflect the stresses of pumping in the system.

Q. And in relation to that, are you aware that my client, Mary Robinson, has five water wells on her property just to the south of the proposed SR1? In terms of calibrating the model, did you obtain information from Ms. Robinson as to how she operated her five water wells and how much water she pumps out of those wells for herself personally and for her livestock and her horses?

A. MR. YOSHISAKA: No, we did not obtain data specifically from Ms. Robinson's wells.

I would note that she's located near, you know, the diversion and the diversion structure which is, you know, distal from the reservoir areas.

Further, you know, she's situated at a relatively low elevation within -- within the overall regional assessment area. And as well, I believe that her wells are located quite close to the Elbow River itself, and as such, a lot of the stresses for her wells would be, you know, somewhat buffered by the levels in the Elbow River itself.

Q. How does the model capture these pumping events cumulatively when it wasn't even assessed?

A. MR. YOSHISAKA: Again the model is calibrated to the baseline water levels that we observed across the area. So those levels would already reflect pumping that happens. So that's what our model was calibrated to.

You know, Mr. Chairman, I think it's also important to understand what it is that we're asking of our model.

First and foremost, this model is created to assess the effects of the operation of the SR1 project, and the operational phases of this project even during the largest design flood event are relatively short in time. Certainly in terms of geologic time, I mean they're a blink of an eye.

So some of these effects and turning on and off of pumps, you know, at the timeframe over which we're

using this model, you know, we don't believe that they'll be largely material.

Secondly, you know, our model is there to assess conditions with the project and without the project. And by comparing those two, we get an understanding of what the incremental change is.

So you know, the operation of domestic wells within the regional assessment area are going to happen with the project and without the project. So in either case, the effects of them would tend to net out when you're examining change in level, change in groundwater levels related to operation of the project.

Q. So, Mr. Yoshisaka, you're asking the Natural Resources Conservation Board to make a decision based on a model, and so we need to have faith, right, in the model?

A. MR. YOSHISAKA: Mr. Secord, again the model is a tool that we've used to inform our effects assessment. It allows us to characterize the nature of those effects which we have done. It also informs our monitoring and mitigation plans.

So by conducting the modelling exercise, we have a sound understanding of the flow regime. We have a sound understanding of where water levels are in relation to wells. We have a sound understanding of the distribution of wells across ERA, and we have an

understanding of, you know, other features like springs as well and why they occur where they do occur.

So you know, the model helped us -- gave us information, everybody, all of that. And, you know, it informs our characterization of those pathways, of those effects, and also informs how we're able to monitor for those effects. And in turn, should the modelling, or sorry, should the monitoring suggest that there's changes afoot that we need to apply further mitigation to, then we'll be able to react in kind and put those measures in place.

Q. Will Mary Robinson be pumping effluent contaminants into her five water wells from the diversion channel?

A. MR. YOSHISAKA: No.

Q. Did you model that?

A. MR. YOSHISAKA: I'm sorry, Mr. Secord, I'm not sure I understand your question fully. Could you perhaps elaborate on the mechanism that you're speaking to right now?

Q. Okay. You have a flood, you have the diversion channel containing sewage. You have a head pond as a result of your operation of the inlet gates. Is there a potential for contaminants that are sitting in the diversion channel; is there the potential for those contaminants to find their way into my client's

drinking water?

A. MR. YOSHISAKA: Mr. Chairman, it's important to recognize that if this project is in operation, it's because there's a flood going on. And when there's a flood going on, the floodwater that's being diverted into the river channel is the same floodwater that's in the Elbow River valley itself.

Given that Ms. Robinson is situated quite close to the Elbow River valley, I would submit that that water is there in the river valley already; it's quite close to her already.

The project diverting water from there and moving it further distance away from her would pose no incremental risk associated with that.

Q. Do you agree that the new configuration of the landscape post-construction of SR1 will likely alter groundwater flow patterns to some degree, and why was this risk not assessed?

A. MR. YOSHISAKA: Mr. Chairman, we -- our modelling does indicate that there are potential for some changes in groundwater flow patterns as a result of the project; it does acknowledge that. We did assess that, and we characterized those effects within the effects assessment.

Q. If we could turn up Exhibit 110, PDF page 85,

Figure 3-28.

THE CHAIR: Just excuse me, Mr. Secord. I'm not sure how many questions you might have on this exhibit, but it's 10 to 5. I would like to adjourn pretty close to 5, and I think we have just a couple of quick housekeeping things before that, but --

So did you have a number of questions on this exhibit? If so perhaps we could wait until tomorrow morning. If not, then if you could ask the question or two on this before we close and proceed.

MR. SECORD: Sure. That would be really good.

Q. And I think, Zoom host, if you could -- if you could give us the centre of this picture, and I've got mine at about, well, I would say, you know, maybe one more, but you're in a perfect position there. Thank you very much. That's beautiful.

So we have, as I understand it, the pink line, the pink shading on this figure is the Tsuut'ina First Nations lands; is that correct?

A. MR. YOSHISAKA: That's correct.

Q. And then you have the outlet of the PDA in black?

A. MR. YOSHISAKA: The outline of the PDA is in a solid black line. The extent of the LAA is in the dotted black line.

Q. And you have indicated to us that the flow of

groundwater will be to the south and southeast of the PDA; correct?

A. MR. YOSHISAKA: In areas on the north side of Elbow River, yes.

Q. And you can confirm that my client Mary Robinson is to -- I guess she's to the south and southeast of the PDA, correct, her five water wells?

A. MR. YOSHISAKA: Relative to the PDA, yes. However, again, you know, her properties there are in the river valley itself.

So the flow directions in those areas are, you know, more constrained by the river itself, rather than what is experienced in other more upland areas of the PDA.

Q. And in the legend, there is -- the blue dot is the AWW ID records. So that would be basically the Alberta water well information?

A. MR. YOSHISAKA: That's correct.

Q. And are all five of Ms. Robinson's water wells shown on Figure 3-28?

A. MR. YOSHISAKA: Subject to check, they -- they could be.

One of the issues with the information coming out of the Alberta Water Well Information Database is that the positional information associated with a well is

logged to -- in many cases, particularly for older wells, is logged to the centroid of a quarter section.

So if you have multiple wells in the same quarter section, they end up plotting on top of each other essentially.

Q. And were any of Mary Robinson's wells part identified by the red dots which in the legend is the domestic well testing program well?

A. MR. YOSHISAKA: Mr. Chairman, I would have to double check on that point.

Q. Would you mind doing that.

And then maybe, Mr. Chair, I think you said you did -- do you want me to go till 5 or would you like me to stop here?

THE CHAIR: If this is a reasonable place to stop, Mr. Secord, I think that would be good because I've got just a couple of quick housekeeping and we can probably end then close to 5 and start again tomorrow?

MR. SECORD: Sure. So if you could give me an undertaking to just to let me know which of -- if any of these red dots represent Mary Robinson's wells.

UNDERTAKING - TO ADVISE IF ANY OF THESE RED DOTS ON FIGURE 3-28 REPRESENTS MARY ROBINSON'S WELLS

MR. SECORD: And then just to leave you with my

question for tomorrow is, you know, dealing with over geologic time, given that we know that selenium and uranium are present, what is the potential for my clients' wells south and east of the PDA to be contaminated with selenium or uranium. You know, and maybe not Ms. Robinson, maybe not this generation but the next generation or the one thereafter. So that would be something we'll pick up tomorrow. But just a heads up, Mr. Yoshisaka, I'd like to ask you about that. Okay?

A. MR. YOSHISAKA: **Thank you, Mr. Secord.**

MR. SECORD: Thank you, Mr. Chair. By the way, can you tell me how much time I've got left for tomorrow? I'm hoping I've got two hours for tomorrow, but...

THE CHAIR: Well, I mean --

MR. SECORD: I'm in your hands.

THE CHAIR: Yeah, to meet your time, I think it's, if I have it right, closer to an hour and 15.

MR. SECORD: I had it as 90 minutes as a minimum tomorrow, but -- but I did my math with the 360 minusing the 15-minute break so...

THE CHAIR: Right. I thought I did too. So it would be around an hour and a half, subject to check. I mean it's right around that.

MR. SECORD: I'm fine with that, sir. Thank you.

THE CHAIR: Thank you, panel.

Just before we break for the evening, though, I understand, is there another errata that Alberta Transportation has to get on the record? Do I have that right?

MR. BARBERO: Mr. Chair, it's Michael Barbero speaking, sir. I've only referred to one today, and that's the one that I repeated this afternoon, Exhibit 157, page 9.

Sir, I'm in your hands if there was something else that you were thinking of.

THE CHAIR: No, I had a heads-up, Mr. Kennedy thought -- was there another one?

MR. KENNEDY: There was the corrections to the hearing transcripts that you filed at 10:15 this morning, something like that.

MR. KRUHLAK: Mr. Kennedy, I was thinking of speaking of those first thing in the morning as to the best way to deal with them, but I'm happy to receive your suggestions or directions now. We did file a series of what we identified as some transcript corrections for the transcripts from last week this morning, and we've also just recently filed this

afternoon responses to several undertakings.

So if you have a preference as to how we best address those, we welcome hearing from you.

MR. KENNEDY: It seems to me the Chair opened the door to kind of deal with the housekeeping matters, so I thought sounds like a good time. And if we could -- and those documents in both cases were circulated broadly to counsel when you tendered them to the Board.

So barring any objections, I don't know why we wouldn't assign them an exhibit number, and then they could be circulated and posted on the website this evening.

MR. KRUHLAK: Thank you, Mr. Chairman, we appreciate doing that, and I appreciate Mr. Kennedy raising it right now. I thought we'd otherwise raise it in the morning, but it's good to have it dealt with.

THE CHAIR: Okay. So -- and Mr. Kruhlak, you indicated what those were, circulated to other counsel. Were there any objections to those?

MR. SECORD: Yeah, I notice that in the AUC hearings, you know, parties will send transcript corrections to the AUC, and they get posted. I don't know that they get marked as exhibits, but I don't have any particular problem with them being marked as an

exhibit.

I'm just -- I'm not sure, sir, that we're going to go through the transcripts line by line and send in corrections. So I hope if, with Mr. Kruhlak, with his superior manpower, if he sees anything in our -- in our answers, it would be nice if he'd include those as well.

But I'm not sure we're going to spend the time to go through every line and say, "Oops, this should have been an "an" rather than whatever." So with that I just hope you won't judge us negatively.

MR. KRUHLAK: We hang on your every word, Mr. Secord.

MR. KENNEDY: I take it that's a non-objection to these corrections?

MR. SECORD: Yes.

THE CHAIR: Mr. Kennedy, what would be your preference in terms if -- it's on the record it's accepted I guess, that might be --

MR. KENNEDY: I don't know that there's any magic in the exhibit number, other than locating them in the future, which has some benefit. I don't see a reason not to assign an exhibit number.

THE CHAIR: Okay. If no objections, let's do that. And so those would be 376. Do I have that

right, Ms. Friend?

MS. FRIEND: Yes, that's correct.

EXHIBIT 376 - MARCH 22 TO 26, 2021, TRANSCRIPT CORRECTIONS

MR. KENNEDY: They should have separate exhibit numbers, those two.

THE CHAIR: And there's an undertaking as well; right?

MR. KENNEDY: Yes.

THE CHAIR: Yes, that one was -- what did that deal with, sorry?

MR. KENNEDY: It was Undertaking 4, 5, and 6.

MS. FRIEND: And 9 all in one document.

THE CHAIR: Okay. And those were also circulated --

MR. KENNEDY: Yes.

THE CHAIR: -- and no further questions. Hearing none. Okay, those can be 377.

MS. FRIEND: Yes, that's correct.

EXHIBIT 377 - AT RESPONSES TO UNDERTAKINGS 4, 5, 6 AND 9

THE CHAIR: And I -- thank you, Mr. Kruhlak and Mr. Barbero. I understand the City of Calgary, Ms. Senek was there an undertaking that you had prepared and circulated as well?

MS. MUNKITTRICK: Yes, Mr. Chair. This is Sara Munkittrick with the City of Calgary. We had prepared a response to an undertaking that was with respect to the catchment area for MC1 that came up in cross-examination of Mr. Frigo on Friday, and that was circulated to Ms. Friend, as well as counsel for SCLG earlier today.

And I guess I would say the same as the undertakings we were just discussing, that it should probably be given an exhibit number as well.

THE CHAIR: Agreed, yes. Ms. Friend, that will be 378.

MS. FRIEND: Yes, correct.

EXHIBIT 378 - CITY OF CALGARY UNDERTAKING RESPONSE WITH RESPECT TO THE CATCHMENT AREA FOR MC1

THE CHAIR: Thank you, Ms. Munkittrick.

MS. MUNKITTRICK: Thank you.

THE CHAIR: Any other business or matters before we close today?

Okay. Hearing none. Tomorrow morning, 7:45 sign-on and 8:30 start. Thank you very much, everyone. Much appreciated. Talk to you tomorrow morning.

PROCEEDINGS ADJOURNED TO MARCH 30, 2021 AT 8:30 A.M.

Certificate of Transcript

We, the undersigned, hereby certify that the foregoing pages 1365 to 1625 are a complete and accurate transcript of the proceedings taken down by us in shorthand and transcribed from our shorthand notes to the best of our skill and ability.

Dated at the City of Calgary, Province of Alberta, on March 29, 2021.

"Lorelee Vespa"

Lorelee Vespa, CSR(A) RPR CRR
Official Court Reporter

"Deanna DiPaolo"

Deanna DiPaolo, CSR(A)
Official Court Reporter

- I N D E X -

VOLUME 6

EXHIBITS

UNDERTAKINGS GIVEN

UNDERTAKING - TO ADD A CONDITION MANDATING THAT THE STONEY NAKODA BE PART OF THE ALBERTA ENVIRONMENT MEETINGS FOR THE MANAGEMENT OF THE SR1 PROJECT ON THE ELBOW RIVER, WERE IT TO BE CONSTRUCTED	1447
UNDERTAKING - TO PROVIDE THE 2016 TRANSALTA UTILITIES AGREEMENT CONCERNING WATER MANAGEMENT OF THE GHOST RESERVOIR TO THE STONEY NAKODA - REFUSED	1448
UNDERTAKING - TO CHECK AND ADVISE WHAT STATION STANTEC USED TO CALCULATE THE PERCENTILE VALUES CALCULATED FOR THE SNOW WATER EQUIVALENT EXCEEDANCES AND THOSE CALCULATED USING DATA FOR THE ELBOW SUMMIT SNOW STATION OBTAINED FROM ALBERTA ENVIRONMENT AND PARKS - ALBERTA BASINS WEBSITE STATISTICS	1495
UNDERTAKING - TO ADVISE IF ANY OF THESE RED DOTS ON FIGURE 3-28 REPRESENTS MARY ROBINSON'S WELLS	1618

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