

JOINT REVIEW PANEL PUBLIC HEARING

IN THE MATTER OF Application Nos. 1844520, 1902073,
001-00403427, 001-00403428, 001-00403429, 001-00403430,
001-00403431, MSL160757, MSL160758, and LOC160842
to the Alberta Energy Regulator

GRASSY MOUNTAIN COAL PROJECT - BENGA MINING LIMITED

VOLUME 21

VIA REMOTE VIDEO

November 21, 2020

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1 Proceedings Taken via Remote Video

2

3 November 21, 2020 Morning Session

4

5 A. Bolton The Chair

6 D. O'Gorman Hearing Commissioner

7 H. Matthews Hearing Commissioner

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8	R. Drummond	For Government of Canada
9	S. McHugh	
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11	A. Gulamhusein	For Municipality of Crowsnest
12		Pass
13		
14	M. Niven, QC	For MD of Ranchland No. 66
15	R. Barata	
16	J. Nijjer (Student-at-Law)	
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18	B. McGillivray	For Town of Pincher Creek
19		
20	D. Yewchuk	For Canadian Parks and
21		Wilderness Society, Southern
22		Alberta Chapter
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24	R. Secord	For Coalition of Alberta
25	I. Okoye	Wilderness Association, Grassy
26		Mountain Group, Berdina Farms

1		Ltd., Donkersgoed Feeder
2		Limited, Sun Cured Alfalfa
3		Cubes Inc., and Vern Emard
4		
5	R. Cooke	For Crowsnest Conservation
6		Society
7		
8	G. Fitch, QC	For Livingstone Landowners
9	C. Agudelo	Group
10		
11	M. Sawyer	For Timberwolf Wilderness
12		Society and Mike Judd
13		
14	(No Counsel)	For Barbara Janusz
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16	(No Counsel)	For Jim Rennie
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19	A. Morehouse	Wildlife Society and the
20	S. Milligan	Canadian Section of the
21	M. Boyce	Wilderness Society
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23	J. Gourlay-Vallance	For Eco-Elders for Climate
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3 (No Counsel) For Alistair Des Moulins
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5 (No Counsel) For David McIntyre
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18
19 C. Forster, CSR(A) Official Court Reporter
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21 (PROCEEDINGS COMMENCED AT 9:58 AM)

22 Discussion

23 THE CHAIR: Good morning, everyone. Just
24 the usual reminder that live audio and video streams
25 and video recordings of this proceeding are available
26 to the public through the AER's website and YouTube.

1 Anyone in the virtual hearing room with their camera or
2 microphone turned on will be captured, and images and
3 recordings of you and your surroundings will be
4 broadcast to a publicly available YouTube video. If
5 you have any concerns about this, please contact
6 counsel well in advance of the time you're scheduled to
7 participate to explain your concerns. We will make
8 best efforts to try and accommodate your concerns
9 considering the need for an open and transparent public
10 process.

11 Are there any preliminary matters before we resume
12 questioning?

13 MR. IGNASIAK: Mr. Chair, it's
14 Martin Ignasiak. Just something for the Panel's
15 consideration, given that, you know, we've got an extra
16 two days on the water section coming up on Monday and
17 Tuesday. Most of our witnesses kind of assumed that
18 this hearing would run through November and not into
19 December. One thing we wanted to bring up for
20 consideration -- and I know you'll have to get views
21 from other parties over the next couple of days, but --
22 would be to combine the last two topic blocks. We're
23 looking -- there's a pretty limited number of witnesses
24 involved in these last two topic blocks, so we thought
25 there might be some consideration given to combining
26 them. And also a concern we've had from the beginning

1 is that splitting air from health is likely to lead to
2 some issues during the conduct of cross-examinations
3 because -- because the health discipline relies so
4 heavily on the conclusions of the air assessment that's
5 done, which, you know, is kind of standard within the
6 environmental impact assessment world.

7 So for those reasons, we thought that there should
8 be some consideration to -- to combining the two topic
9 blocks, the last two into one session. And, you know,
10 that would give us Wednesday through to Saturday, four
11 days, to finish that combined topic block, which we
12 think is achievable, given the estimates that have been
13 provided.

14 So we just wanted to raise that. And I know
15 you'll have to check with other parties and they'll
16 have to think about it and check with their witnesses,
17 but it's something we would urge the Panel to consider.

18 Thank you.

19 THE CHAIR: Okay. Thank you,
20 Mr. Ignasiak.

21 So, yes, I'll want to seek the views of the other
22 participants. I won't do that right now. They
23 basically just heard that. So I'll maybe turn to them
24 either later today or Monday morning to get their views
25 on how that might impact them or not.

26 So anything else? Okay.

1 Mr. O'Gorman, you may continue.

2 GARY HOUSTON, DANE MCCOY, MIKE YOUL, MIKE BARTLETT,

3 CORY BETTLES, DAVID DEFOREST, SOREN JENSEN,

4 MARTIN DAVIES, LEIF BURGE, DAN BEWLEY, Previously

5 Affirmed

6 STEPHEN DAY, NANCY GRAINGER, Previously Sworn

7 (Water, including surface and groundwater management,

8 quantity and quality, selenium management and aquatic

9 resources, including fish and fish habitat and fish

10 species at risk)

11 Alberta Energy Regulator Staff and Panel Questions

12 Benga Mining Limited

13 MR. O'GORMAN: Thank you, Mr. Chair.

14 Q MR. O'GORMAN: Good morning, Mr. Houston.

15 A MR. HOUSTON: Good morning, Mr. O'Gorman.

16 Q And good morning, Benga panel.

17 MR. O'GORMAN: Ms. Court Reporter, can you
18 give me a -- I don't see you on the screen, but how is
19 my volume today?

20 THE COURT REPORTER: It's fine.

21 MR. O'GORMAN: Okay. Thank you.

22 Q MR. O'GORMAN: Okay. So let's begin. I'll
23 ask you a couple of questions about sulphates, please.
24 I'm going to start off by saying, in the interest of
25 trying to save some time today, I might refer to
26 registry documents for the record where they are but

1 maybe not haul them up if I ask you folks to confirm
2 that you are aware of them and you agree with how I
3 characterize them. Does that make sense, Mr. Houston?

4 A MR. HOUSTON: Yes. Yes, it does.

5 Q Just to save that bit of time to look some things up.
6 And I'll start with one of those right now.

7 So in Addendum 11, which was Registry
8 Document 13 -- and it started at PDF 458.

9 MR. O'GORMAN: But, Zoom Host, don't bring
10 that up right now, please.

11 Q MR. O'GORMAN: You did submit to us a report,
12 Biancan [phonetic] or Biancan report. It found that
13 sulphates can be removed in a saturated backfill zone.

14 Mr. Jensen, you briefly touched on sulphate
15 reductions yesterday. Mr. Jensen, I wonder if you can
16 confirm that it is -- first of all, that you folks are
17 aware of that document you submitted; and, secondly,
18 would you agree that sulphate can be reduced in a
19 saturated backfill zone?

20 A MR. JENSEN: Yes. Good morning,
21 Mr. O'Gorman.

22 Yes. So I am aware of that document, and I do
23 believe I briefly touched on this yesterday. So, yes,
24 sulphate can be removed in -- in a saturated backfill
25 zone, although I would add that it's not -- it's not
26 necessarily desirable to go to reducing conditions that

1 are quite that -- quite that reducing.

2 Q Okay. Did you folks conduct any studies that inform
3 what the potential sulph -- removal of sulphites might
4 look like in your saturated backfill zone?

5 A No, we did not.

6 Q Okay. Not in the past. Ongoing, is that currently
7 being tested?

8 A Not -- not to my knowledge, no.

9 Q Okay. If I were to ask you, in your sort of
10 professional expertise, what sort of a percentage
11 reduction of sulphates we might see in your saturated
12 backfill zone once they're -- once they're -- you have
13 them in place, is it the sort of thing where we might
14 see less than 5 percent reduction, 20 percent
15 reduction, 40 to 50 percent reduction? Do you have any
16 sort of sense about what's reasonable to expect?

17 A Yeah. I mean, it would be on the low end, for sure.
18 It would be -- it would be a -- close to 5.

19 Q Okay.

20 A You know, from what I've seen in the past, you know,
21 I've seen a reduction of 1 to -- say, 1 to
22 200 milligrams per litre but not necessarily -- yeah.
23 So -- so it's -- would be in that range.

24 Q And is your plan to -- pilot going to test this? Is
25 that part of what you have designed for your pilot?

26 A I'm not aware of -- no, I'm not aware of any efforts to

1 pilot sulphate removal, but I guess that would be for
2 Benga, maybe, to answer.

3 A MR. HOUSTON: Yeah, yeah. Not -- not
4 specifically, Mr. O'Gorman. In fact, we would be
5 concerned about the generation of sulphites -- or
6 sulphite, sorry, yeah, hydrogen sulphite specifically,
7 if -- if we started reducing sulphates too readily in
8 the -- in the treatment process.

9 So my understanding -- and Mr. Jensen is certainly
10 the expert -- is that the idea is to aim for an
11 oxygen-reducing potential that nicely treats the
12 selenates but doesn't dip too deep into the sulphates.

13 Q Okay. And would your plan -- in your pilot, will you
14 be monitoring to see if this is happening?

15 A Yes, certainly. That's -- that's the idea.

16 Q Okay. Okay. Thank you.

17 What seems like a long time ago, Mr. Houston, I
18 promised you we would come back and talk about the
19 advanced oxidation process, so let's do that. There's
20 a -- I'm not -- again, I'll refer to this reference.

21 MR. O'GORMAN: But, Zoom Host, you don't need
22 to bring it up.

23 Q MR. O'GORMAN: Also in Addendum 11, it was --
24 which is Registry Document 313, on PDF 229, you did
25 tell us -- and I'll actually read the sentence that's
26 there. You said that Benga will: (as read)

1 ... implement advanced oxidation processes
2 with powerful oxidant like hydrogen peroxide
3 injection or ozone addition, if necessary, to
4 further the conversion of carry-over selenite
5 to selenate.

6 Mr. Houston, can you confirm that that's -- and you
7 actually read that statement into the record in your --
8 in your opening statement or beginning of this session,
9 one of the two? Can you confirm that?

10 A I remember this statement, yes.

11 Q Okay. And I don't need to bring up that transcript.

12 So we want to understand this advanced oxidation
13 process a little bit.

14 MR. O'GORMAN: I will ask us to haul up, Zoom
15 Host, please, Registry Document 251, and it's PDF 257.
16 This was the Addendum 10, package of responses on our
17 water questions.

18 And can you scroll to the bottom of that picture,
19 please. Zoom in a bit, and let's look at the bottom
20 part of the -- of the -- of the figure. Maybe zoom in
21 one more level. Great.

22 Q MR. O'GORMAN: Okay. So in Addendum 10,
23 Mr. Houston, we received this figure showing conceptual
24 layout of some of the -- some elements of the water
25 treatment system. I wonder if you can -- I didn't
26 refer to this earlier, but you have also referred to

1 there being a cascade that you planned to implement for
2 the outflow coming out of the saturated backfill zone.

3 I wonder -- we were looking at this figure of
4 where all the different pieces of this water treatment
5 system are going to fit. I wonder if you can tell us
6 roughly where both the advanced oxidation process
7 system -- we'll talk about that in a sec -- and also
8 the cascade that you referred to, where are they --
9 where do they go in here? Roughly, at least.

10 A So -- okay. They're not explicitly shown here,
11 Mr. O'Gorman, and I -- I understand the concern about
12 the space. I think one of the things that we have to
13 understand is that by the time the SBZ is in service,
14 that that part of the -- the pit is -- is filled and is
15 starting to be reclaimed. So that -- that's not
16 evident on the drawing, but -- so there is the
17 potential to, you know, move some of that hardware, if
18 you will, towards the SBZ and eventually even place
19 some of that -- you know, these extra bits and pieces
20 on top of the SBZ.

21 So, you know, as -- as we get into this stage of
22 the operation, we actually have a lot of space for --
23 for the extra bits and species.

24 Q Yeah. When you talk about reclaiming the pit, I think
25 the saturated backfill zone -- essentially, it starts
26 there; right? So you are saying you might build some

1 of the pieces of the water treatment system over your
2 SBZ?

3 A If -- if necessary, yes.

4 Q Okay. Let me see. You have in your various documents,
5 going back to when we first received the -- the EIS a
6 number of years ago and then somewhat evolving over
7 time through different submissions we've received in
8 response to information requests, heard about a number
9 of different pieces of the potential water treatment
10 system.

11 So we wanted to confirm our understanding of which
12 of these you do plan definitely to implement as part of
13 the post-SBZ treatment and which are still question
14 marks. So I'm going to go through a list. While we're
15 looking at this diagram, it's useful if you have --
16 well, if you would like to sort of suggest where they
17 might fit or if they're already illustrated on here.

18 Metals treatment plant?

19 A That's an operational piece that -- that would be
20 implemented based on how we see the -- the metals such
21 as arsenic, and that would start to be informed with
22 the -- the pilot project, and then we would continue to
23 monitor arsenic. So that would -- that's an
24 operational piece. We're not sure if it's going to be
25 required or not.

26 Q Okay. A post-SBZ selenium treatment plant?

1 A Again, that would be an optional piece, and that would,
2 you know, depend on the performance of the SBZ.

3 Q And would it be included in the -- like, as a part of
4 the same structure as the metals treatment plant, or do
5 you have to find someplace else to put it?

6 A I would think that in -- again, it would -- these
7 things all are going to develop together, and so it
8 would be something we would have to assess at the time.
9 Do we need the full metals treatment plant? Do we need
10 the full SBZ treatment plant?

11 By the way, we would also, at the same time,
12 consider whether a gravel bed reactor might be a more
13 appropriate step, and that clearly would have to be
14 located north of -- well, on top of the SBZ, if you
15 will, so ...

16 Q Yeah. Well, that was my next -- that was my next
17 bullet, gravel bed reactors.

18 A Yeah.

19 Q So those are operational, I think you said. I'm sorry.
20 Did you just say they go on top of the SBZ?

21 A They -- we would have to find space. They take up
22 quite a bit more space, and so we would be looking at a
23 site potentially on top of the SBZ.

24 Q Okay. How about the cascade system?

25 A The cascade system -- there's quite an elevation drop
26 from the -- from the SBZ down into the polishing ponds

1 and the -- and the clean water pond, and then there's
2 another significant drop from there down into
3 Blairmore Creek. So we -- we would put cascading
4 systems potentially in both of those, you know,
5 channels.

6 Q Okay. So you would basically have a channel at the
7 bottom of your SBZ. There's an extraction well, which
8 takes up the water which has been sitting there being
9 treated for some time, and it flows right down from
10 there into those ponds; is that right?

11 A That's right. I'm trying to see what the -- these
12 isometric lines, what the scale is there, but I think
13 it's -- is that 20 metres?

14 Q Typically they would be 20, I think; right?

15 A Yeah. They're 20 metres? Yeah. So somebody with
16 better eyes says they're 20 metres.

17 So you can see from the out -- outfall well from
18 the SBZ you've got 20, 40 -- 40 or 50 metres of drop,
19 which is a good drop in a short distance. So we could
20 build a cascading system in there.

21 Q Okay. Next bullet, the advanced oxidation process.

22 A Again, that's something that's optional. It -- the --
23 and so I'm not a designer. I might throw this over to
24 Soren, but these things come prepackaged, and I've seen
25 the dimensions of the one that was installed by Teck at
26 West Line Creek. So I think that could fit in -- in

1 the spaces in between here.

2 But likely we want to install that in a place
3 where we've got the water in a pipe or in a -- you
4 know, out of a pump, and so we would -- we would
5 probably have to put that in between those two ponds
6 somewhere.

7 Q Okay. And I don't think I heard you -- and I think we
8 missed this part of the cascade system. Is that a
9 definite yes, or it may be?

10 A It -- we need to drop that water those 50 metres, and
11 so we'll need a cascade system just -- just to drop it
12 into the pond with -- and absorb the energy in the
13 water. So it -- yes.

14 Q Okay. Post-treatment holding ponds?

15 A Those -- those are those two ponds that you see there.

16 Q Right. And those are definite, not maybes?

17 A Yes.

18 Q Okay. Any other pieces of the post-SBZ water treatment
19 system, or is that everything that we might consider
20 that is either planned for sure or might be
21 implemented?

22 A That -- that's all. The rest is basically pumps and
23 pipes, Mr. O'Gorman.

24 Q Okay. Okay. And I suspect I know the answer to this,
25 but for all of the items that you just said are to
26 potentially be constructed at a later date, can you

1 confirm whether or not you have currently identified
2 what the triggers would be for your decision to proceed
3 with building any of those extra pieces of
4 infrastructure?

5 A We have not, but as we discussed yesterday, that --
6 that decision mechanism will begin to be informed by
7 the pilot project and -- and will be developed at that
8 time.

9 Q Okay. Back to the advanced oxidation process. Let's
10 just call it the "AOP". So can you confirm -- or,
11 actually, can you tell me: You have said -- actually,
12 can you confirm that its main objective is to convert
13 selenite to selenate?

14 A That -- that is the reason that we would install it,
15 is -- is to convert selenite. And -- and, I should
16 say, other -- other species, organo species of selenium
17 to -- to selenate, yes.

18 Q Okay. Any other potential benefits or uses of that
19 system?

20 A I'm going to look across at my -- Soren -- Mr. Jensen
21 maybe could add something on that.

22 A MR. JENSEN: Yeah. I mean, the oxidation
23 step, obviously, the objective of re-aerating the water
24 and also if -- if it's necessary, for example, to
25 remove manganese, oxidation would help with that. See,
26 other than that, yeah, nothing -- nothing really stands

1 out at the moment of, you know, expected parameters
2 that we have to deal with.

3 Q Okay. Mr. Jensen, while you're up -- and, actually,
4 Mr. Houston sort of referred to this as well. The
5 system that you're familiar with at Teck, can you
6 briefly describe it? I mean, is it a plant? What are
7 its dimensions? What does this thing look like?

8 A Actually, I'm not specifically familiar with the unit
9 they've installed at West Line Creek.

10 So I don't know. Gary, do you have some
11 familiarity? I know conceptually how it works, but I
12 haven't seen the unit myself physically.

13 A MR. HOUSTON: I -- I only have seen pictures
14 of it. I'm not familiar with the operation at -- at
15 the chemistry level, but it -- it was -- the unit that
16 I saw at West Line Creek was attached to the side of a
17 water treatment plant. It -- it -- I think there's a
18 photo in one of the Teck presentations that shows it
19 clearly. It would -- it would fit in between the ponds
20 there, for example, if you're thinking about the size,
21 Mr. O'Gorman.

22 Q Yeah. Well, I am thinking about a few things. I mean,
23 I think you agree, Mr. Houston, the first we heard of
24 an advanced oxidation process system was earlier this
25 year in Addendum 11; right?

26 A Yes.

1 Q Right. And we haven't really been told any information
2 about its potential effectiveness. It's literally a
3 few lines in your response.

4 A And so I think the information that we do have that's
5 pertinent to this case is the application that Teck has
6 made of this technology at the West Line Creek and
7 specifically for the purpose of removing selenium
8 species at that plant. So we did include a paper. I
9 believe it was in --

10 Was it in Addendum 11 that we included that paper?

11 Either Addendum 11 or in our August submission
12 we -- we attached that paper.

13 Mr. Jensen will add to that.

14 A MR. JENSEN: Yeah, Mr. O'Gorman. I would
15 like to add that it really is not our expectation that
16 a unit like that will be necessary. So that's -- in my
17 mind, that's the primary reason why you didn't hear
18 about it before, is that it wasn't really proposed
19 as -- it wasn't proposed as part of the -- our initial
20 thinking around the -- the saturated -- the SBZ.

21 It came about in response to an IR that said,
22 Well, what would you do in the event that, you know,
23 we -- we saw selenide, organoselenium?

24 And, by the way, nitrite is another one that came
25 to mind after you -- you asked me what else it would be
26 useful for.

1 But it -- the expectation still is that this unit
2 will not be required. We just -- we don't have any
3 specific evidence that it would be necessary, but it --
4 it is a contingency measure.

5 Q Okay. So it's -- it's not just a contingency measure;
6 right? But would you say that it is your main
7 contingency measure if it turns out that you have
8 selenite coming out of your 'S' -- of your SBZ, rather
9 than the selenate that you're hoping for?

10 A Yeah, that's correct.

11 Q Okay.

12 A I mean --

13 Q And -- go ahead.

14 A I'll let you go ahead.

15 Q No, no, no. Please continue.

16 A Well, I'll just add that, you know, as far as the
17 treatment process goes, it's -- oxidation is -- is a
18 pretty standard unit -- unit operation. I mean, it's
19 used everywhere in -- it's used for disinfection in
20 municipal water treatment. Occasionally, a variety of
21 that system is used for -- for treatment of ammonia.
22 So it's not -- like, these aren't -- these aren't sort
23 of exotic-type treatment units. So it's -- anyways, I
24 would just add that for the record.

25 Q Are they expensive?

26 A I suppose that depends what you mean by "expensive". I

1 mean --

2 Q Well, I mean, one of the questions -- and I'll get to
3 it a bit later, but I just want to clarify that the
4 cost of adding on an advanced oxidation process to your
5 water treatment system has not been factored into
6 your -- your costs and your accounting and your project
7 economics; right?

8 A MR. HOUSTON: So, Mr. O'Gorman, we haven't
9 priced it out, obviously, but just looking at the size
10 and the complexity of the unit that was installed at
11 West Line Creek, I don't think it's going to have a --
12 well, it's going to be in the -- in the contingency
13 factor of the cost estimate for the project.

14 And, again, as Mr. Jensen mentioned, our
15 expectation is that it's a contingency plan and not
16 likely something that will be required.

17 Q And recognizing that if it's, you know, a box that you
18 have to buy and install up-front is one question, but
19 if it were to be required on an ongoing basis, do you
20 have a sense of the operational costs of adding it in
21 for potentially long-term treatment if -- if it was
22 required?

23 A Again, I wouldn't think it -- it would in the -- the
24 contingency -- or not the contingency but the -- the
25 margins of the operating costs for the project.

26 If -- if you would like, Mr. O'Gorman, I have

1 found the page that shows what the -- the advanced
2 oxidation equipment looks like at West Line Creek.
3 It's a photo in a presentation by Teck. Would that be
4 helpful to look at?

5 Q Is it submitted? Do I remember seeing that?

6 A It is.

7 Q Right. Let's not --

8 A It is. Okay.

9 Q Let's not bother right now if -- just in the interests
10 of time, if that works for you.

11 A I'll just say, it's at Document 503, PDF 45 -- sorry,
12 PDF 60, and there's a photo there that shows the
13 installation.

14 Q Great. Thanks.

15 MR. O'GORMAN: You don't have to bring that
16 up, Zoom Host, but we'll look at that later, for sure.

17 Q MR. O'GORMAN: Okay. So with the AOP,
18 recognizing it's a contingency if you have selenite --
19 and you believe you will not -- remind us why you would
20 want to get rid of selenite if it turns out that it is
21 coming out of your SBZ?

22 A And this -- this is exactly the issue they had at the
23 West Line Creek plant, that the selenite and some of
24 the organo species -- and, again, we have others who
25 are more knowledgeable about this. But they -- the
26 bioaccumulation is more aggressive, and our modelling

1 for the selenium site-specific objective would -- would
2 need to be adjusted if that were the case.

3 Q Okay. Because sulphates only mitigate the uptake of
4 selenate?

5 A Exactly.

6 Q All right. So what would happen if this Panel decided
7 to not accept your proposal for a sulphate-adjusted,
8 site-specific water quality objective for selenium? In
9 that case, would the advanced oxidation process be
10 moot, or would -- would it still be something you would
11 consider?

12 A Well, so it -- it would still be a protective measure.
13 We would have to look at how our selenium treatment
14 through the SBZ needs to be modified to meet a more
15 difficult bar, let's say, for selenium in Blairmore
16 Creek. So we -- we would -- I'm not sure whether it
17 would be necessary or not, Mr. O'Gorman. It would
18 depend on how the project needed to be adjusted to --
19 to meet the -- the different objective for -- for
20 selenium in Blairmore Creek.

21 Q Okay. I lost my place a little bit, but I did want to
22 ask you if you, Mr. Houston or Mr. Jensen or Mr. Day,
23 have a sense of how you're going to tell, with the
24 selenium that you take out of your SBZ, what the
25 speciation is between selenate and selenite?

26 A Well, you can -- you can test the water, Mr. O'Gorman,

1 and determine what the species are. We've done that
2 with some of our column testing, and -- and I know that
3 that's been done at Teck, for example, when they --
4 when they had the issue.

5 I wouldn't see that as an operating, real-time
6 kind of thing that we would check, simply because
7 the -- the process, as Mr. Jensen's pointed out, is
8 fairly slow moving, and so if -- if there was pure
9 selenate coming out of the SBZ at -- on Monday, we
10 wouldn't expect that to change by Thursday. We would
11 look at that speciation analysis as something you would
12 do in a longer -- longer time frame.

13 Q Okay. And, Mr. Jensen, yeah, can you sort of confirm
14 this: Is that a very easy, standard analysis on the
15 speciation? Is it the type of analysis that you would
16 have -- would have to do in a lab on-site versus
17 sending off to a lab in Calgary or somewhere else?

18 A MR. JENSEN: No, it would definitely be
19 done by an accredited lab off-site. It -- it's, I'll
20 say, slightly -- slightly a specialized analysis, so
21 it's -- you know, I'd say it's more and more commonly
22 available, but it -- it's certainly no problem for an
23 accredited lab to do that. But, no, you would not be
24 able to do that on-site.

25 Q Okay. But as you said, Mr. Houston, I guess, your
26 suggestion is you wouldn't worry about it in terms of a

1 daily reading. You would see it as a longer term?

2 A MR. HOUSTON: Yeah. Yeah. No, I think we
3 would look at longer-term trends.

4 Q Okay. I'll go to my next package. Okay. I will now
5 make a -- I'm going to refer to something.

6 MR. O'GORMAN: And, Zoom Host, we don't need
7 to bring it up, but I'll read it into the record.

8 Q MR. O'GORMAN: So in the Addendum 10 response
9 to an information request we issued -- that's
10 Document 251, and it was on PDF 61 -- we'd asked you
11 about the planned federal Coal Mining Effluent
12 Regulations. Your response indicated briefly -- I'll
13 ask you to confirm this -- that achieving the limit of
14 5 micrograms per litre at the point of discharge as --
15 as posed, you know, in draft form in the federal Coal
16 Mining Effluent Regulations is something that may be
17 achievable but would require further research and
18 operational experience. And you did express concerns
19 about those limits.

20 Do you, first of all, want to agree that that's
21 what you told us, or should I pull it up?

22 A No, no. I do agree that's what we -- that's what we
23 talked about in that response.

24 Q Okay. And one extra thing that we don't need to haul
25 up, but, for the record, was in the federal
26 government's hearing submission, Registry Document 542,

1 on PDF 25, Environment and Climate Change Canada did
2 indicate that there was a target date for final
3 publication of this regulation in 2022. Does that
4 sound -- do you remember that, Mr. Houston?

5 A I -- I know that there -- they are still targeting to
6 have that published in that time frame, yes.

7 Q Okay. So we'll let Environment Canada speak to
8 their -- what's happening with that regulation, and
9 that will happen next week.

10 But I would like to know if you -- you stand by
11 your answer that you think you could achieve a level of
12 5 micrograms per litre of -- in the point of discharge
13 from your site, if that's the level you were subjected
14 to under these regulations?

15 A So up till now, we've talked about this 15 micrograms
16 per litre and as -- as a -- the -- kind of a low level
17 that we can expect out of the SBZ. I think if we look
18 at the Teck graphs critically, we can say that the
19 15 is a conservative number, and we -- we could
20 probably achieve less than that. And as Mr. Jensen
21 said a number of times, that -- that may be through
22 some up-front design of the water flow paths. It may
23 be through some recycling or -- or other add-ons that
24 we can -- we can do creatively with our SBZ.

25 I think the -- the truth of the matter is we're --
26 we think there's an upside there. We just can't

1 quantify it or prove it right now.

2 At the extreme, to achieve 5, I think, based on
3 what we know of the technology right now, I -- I think
4 we're going to have to look at some other technologies
5 for concentrating a stream or -- or some -- some --
6 nobody wants to hear this, but dilution of the stream
7 to achieve a 5 coming out of the pipe.

8 And when I talk about concentrating, I'm talking
9 about some membrane technology or distillation or
10 something else to treat a part of the stream and -- and
11 then put that back in with the main stream to achieve
12 a -- a lower number on -- on the main stream, main
13 effluent stream.

14 I think that's where we would have to look to --
15 to get to that lower value.

16 Q Right. I mean, that response raises a lot of potential
17 questions, Mr. Houston. We don't need to explore it in
18 too great a depth, but this extra water that you would
19 dilute it with, where would that come from?

20 A Yeah. No. I'm -- I'm thinking about taking a slip
21 stream of the effluent and having some additional
22 treatment step to maybe simply, you know, dilution
23 or -- or, you know, something like that to -- to
24 achieve a much lower level of selenium in that stream
25 and then recirculating that to dilute the rest of the
26 stream.

1 So it's -- it's just a way of concentrating the
2 selenium or -- or, you know, providing extra treatment
3 to part of the stream to achieve the overall effect of
4 5 micrograms per litre.

5 Q Okay. But you do acknowledge that that regulation
6 would be a limit you would have to meet at the end of
7 pipe of your responsibility, not --

8 A I --

9 Q -- diluted into the stream; right?

10 A Yeah. No, no. And that's -- that's the challenge. If
11 it were diluted in stream number, I think that would be
12 much closer to what, in fact -- I think we would meet
13 that during many phases of the -- the project. It's --
14 it's the end-of-pipe number that creates the
15 difficulties.

16 Q Okay. So --

17 A MR. JENSEN: You --

18 A MR. HOUSTON: Mr. Jensen wants to --

19 Q Go ahead, Mr. Jensen.

20 A MR. JENSEN: Yeah, Mr. O'Gorman. For what
21 it's worth -- and I'm not sure of its relevance to
22 these proceedings, but that -- the challenge we are
23 discussing here is -- is common to -- to all coal-mine
24 operations that would be affected by the pending Coal
25 Mining Effluent Regulations.

26 And I will say, you know, in -- while, you know,

1 we participated in the consultation on the regulations
2 at the time and -- and I asked Environment Canada for
3 their -- you know, they declared that this is
4 achievable, and, of course, it is. You know, with --
5 with enough time and -- and enough effort you can do
6 anything.

7 But I would say this -- this is a common challenge
8 that we do ask any coal operators otherwise out there,
9 existing or future, because even the -- the limit
10 proposed for the existing coal mines are down in a
11 range that -- you know, it's 10 -- 10 micrograms per
12 litre, and, really, to achieve 10, you probably want to
13 operate at 7 to make sure you don't constantly exceed
14 that. Same for 5; you probably want to operate as 3 as
15 an operator. You don't want to be right at the limit.

16 So I -- you know, in as far as -- you know,
17 it's -- it's achievable. I suggest that it's a common
18 challenge across the industry.

19 Q Okay. So you don't think that 5 micrograms per litre,
20 which would be the average you would need to hit at end
21 of pipe, as I recall the regulation -- I am working
22 from memory -- with a 10-microgram maximum grab sample,
23 I think, that's not a project killer, from your
24 perspective?

25 A It -- oh.

26 A MR. HOUSTON: I think I better answer that

1 one.

2 It's -- it's something we would have to look at
3 hard, you know, if that were a condition of the permit.
4 What we've proposed, Mr. O'Gorman, is -- is a project
5 we think is protective of the aquatic environment, and
6 so we've discussed all the pieces involved with that.

7 If that were a condition of the permit or -- or a
8 level we had to meet with the -- the project, we'd have
9 to look at what additional pieces we would have to
10 bring to play and how that affects the project
11 economics.

12 Q Okay. Okay. Let's move on. Very good.

13 So I want to talk a little bit about selenium
14 again. We have a lot of conversation about selenium.

15 Let's -- I want to refer to some documents and, in
16 the interest of time, see if you agree or if we need to
17 haul them up and look at them.

18 Okay. So going back to your original EIS,
19 Consultant Report 5, which was the Hatfield
20 Consultants' report in Document Registry 42. In that
21 document they stated that: (as read)

22 A site-specific objective for selenium for
23 the protection of aquatic life has been
24 developed, linked to concentrations of
25 sulphate, which at higher concentrations
26 modifies and attenuates the uptake of

1 selenium present as selenite.

2 I assume you agree with that, Mr. Houston?

3 A Yes, yes.

4 Q Okay. So let's not bring it up.

5 In Addendum 11, Registry 313, on PDF pages 205 and
6 322 -- and we can pull it up if you want, but you did
7 submit to -- you submitted that as both selenium and
8 sulphate are expected to co-occur over the project
9 life, you expect that when selenium concentrations are
10 higher, sulphate concentrations will also be higher.
11 Mr. Houston, do you agree with -- that you said that to
12 us, and do you still agree with those statements?

13 A Yes. I don't think I need to refer to my experts, but,
14 yeah, it's -- they're both -- they're both leaching out
15 of the rock. And to the extent that the mobilization
16 mechanism is common, we would expect that they would
17 move in parallel.

18 MR. O 'GORMAN: Okay. Now we will haul up a
19 couple of things, please, Zoom Host. We can look at
20 Registry Document 89, and it's PDF page 198. This is
21 Addendum 8. So I think we're at one of the last
22 packages of staff information request -- can you make
23 that a bit bigger? Actually, the first bullet at the
24 top. If you go to the top of the -- on the second --
25 go up to the top of the page, please, Zoom Host. Okay.
26 Good. The second bullet. I don't think this -- sorry.

1 Q MR. O'GORMAN: So the -- what I'm looking for
2 is a reference to -- that concentrations of sulphate
3 are predicted to increase in Blairmore Creek from a
4 background concentration of 20 milligrams per litre to
5 greater than 500 milligrams per litre. Does this show
6 us, or did I give you the wrong reference? Oh, the
7 bullets; right. It's in the --

8 A Yeah. It's in the first bullet.

9 Q There it is. So you agree with that?

10 A That --

11 Q That is what you told us at the time?

12 A I agree -- I agree that's what we told you, yes.

13 MR. O'GORMAN: Okay. Now we're in -- I think
14 this is the same -- yes. It will be Registry 89. It's
15 an appendix, but that's all -- it's all one document
16 for 89, as I recall. We're going to jump to PDF 1021,
17 please, Zoom Host. 1021, yeah. And down to the bottom
18 of the page and let's -- yeah, the very bottom of the
19 page. And if you blow that up bigger, please.

20 Q MR. O'GORMAN: This was the summary and
21 conclusions of a report. As I recall, this was from
22 Mr. DeForest, if I'm -- I didn't write that down, so
23 I'm working from memory. And in his conclusions, he --

24 MR. O'GORMAN: And it scrolls over, if you
25 let people read that, and then, maybe, Zoom Host,
26 scroll to the top of the next page.

1 Q MR. O'GORMAN: And I'll suggest this said
2 that: (as read)

3 The study concluded that a predicted sulphate
4 concentration of 529 milligrams per litre for
5 Blairmore Creek at Node BC07. At that
6 concentration, the proposed site-specific
7 water quality guideline for selenium would be
8 10.6 micrograms per litre, which was above
9 the predicted selenium concentration of -- in
10 Blairmore of 7 micrograms per litre.

11 You -- do you see that there, and you agree that that's
12 what we were -- we learned in the study, their
13 conclusions?

14 A Yes.

15 Q Right. Okay. So, Mr. -- well, Mr. Houston -- or you
16 can throw it to someone, if you like. So if your
17 proposed treatment process in the SBZ does remove
18 sulphate or if Benga is required to manage sulphate to
19 lower levels because of concerns about potential
20 impacts of sulphates on aquatic life in some of the
21 receiving water bodies, tell us what that would imply
22 for the level of treatment of selenium you would need
23 to do to meet a proposed site-specific objective?

24 A So I'm going to jump in here, but I'm rapidly getting
25 out of my area of comfort, Mr. O'Gorman, so I'm going
26 to pass this off as we get deeper and deeper.

1 So what I -- what I heard Mr. Jensen say is that
2 we don't expect a significant amount of sulphate
3 reduction in the SBZ. So our expectation is that --
4 that there -- there wouldn't be an -- not accidental,
5 but a collateral, unintended drop in -- in sulphate.
6 We would -- we would have to change the operation of
7 the SBZ to actively try to reduce the sulphate in
8 response, I suppose, to a requirement that we do so.

9 My expectation is that the -- the water quality
10 objective for selenium -- I would think that the -- the
11 formula would still hold and that the requisite water
12 quality objective for selenium, which is not a fixed
13 number but a -- a number that's based on the sulphate
14 concentration, would -- would reduce in -- in step with
15 that lower level of sulphite.

16 Q Okay. And I do want to confirm: What we heard earlier
17 was Mr. Jensen did agree that there is reason to
18 believe and even some studies that talk to the
19 potential for sulphate reduction to occur in the SBZ,
20 but we don't have any evidence one way or the other
21 that really says about how much of that might take
22 place; right?

23 A And, in fact, my understanding of -- I'm looking at
24 Mr. Jensen to jump in here, but my understanding is
25 that we would manage the oxy -- oxygen reduction
26 potential to cut off at selenium reduction and not --

1 not get deeply into sulphate reduction.

2 Mr. Jensen, do you want to just confirm that?

3 A MR. JENSEN: Yes, Mr. O'Gorman, that's
4 correct.

5 And I believe I touched on that yesterday.
6 It's -- we really don't want reducing conditions that
7 get into the realm of sulphate oxidation -- sulphate
8 reduction, excuse me, because of -- at that point -- at
9 that point, we would be concerned about redissolving
10 selenium in -- in various -- in sort of a -- in more --
11 or at least producing more reduced forms of selenium
12 that could re-mobilize it.

13 So -- but it would take -- it would take -- we
14 would have to really all -- dose methanol consistently
15 for quite some time to -- to get to those
16 sulphate-reducing conditions. So it's something we
17 want to stay clear of; that's for sure.

18 Q Okay. Thanks, Mr. Jensen.

19 I'm going to come to this in a little bit, but I'm
20 prompted to say now, sort of in response, you -- you --
21 and, Mr. Houston, probably, you do acknowledge -- we're
22 going to look at some sulphate predictions that you
23 gave us recently, and if it is not out of the realm of
24 possibility that, in particular, from your monitoring
25 program, you might discover there to be a -- negative
26 impacts on aquatic life from the kinds of sulphate

1 levels that might be produced and you might be required
2 to manage the sulphate down somehow, is that -- is that
3 something you consider in the realm of possibility?

4 A MR. HOUSTON: Realm of possibility, it's --
5 I'm not sure.

6 I think -- I'm wondering if -- Mr. Day, if you can
7 weigh in on the -- the possibility that these --

8 I guess, Mr. O'Gorman, you're -- you're thinking
9 that the sulphate predictions in the water balance
10 model may be not --

11 Q Well --

12 A -- not very accurate or --

13 Q Well, I'll tell you what. And even before Mr. Day
14 jumps in on that, we're going to touch on this very
15 shortly in my questions, and I will show a graph and
16 what -- I will invite Mr. Day to -- and you to maybe
17 respond to it when I show it because we --

18 A Okay.

19 Q -- will haul that up. Okay?

20 A Okay. Okay.

21 Q I did ask that question a bit out of order from my plan
22 to taking you through this, so ...

23 A M-hm.

24 Q Okay. Let's move forward. Here's another document.
25 We want to understand a bit more now about the proposed
26 SSWQO, the site-specific water quality objective. For

1 people's reference, I might just use the abbreviation.
2 I'm going refer to a document.

3 MR. O'GORMAN: We -- Zoom Host, don't bring
4 it up unless Mr. Houston doesn't agree with it.

5 Q MR. O'GORMAN: So in the original
6 Consultant's Report 5, Registry Doc 42, on PDF 124, you
7 did -- was when you presented a water quality-based
8 guideline or objective for selenium, which was, you
9 know, based on sulphate concentrations; right? Do you
10 agree with that, sir?

11 A Yes.

12 Q Okay. Take my word that I'm not, you know, making up
13 the reference. I'm trying to save -- we're trying to
14 save time a little bit here.

15 A It -- it's there somewhere.

16 Q Yeah. Yeah. I'll take responsibility if I got the
17 reference wrong.

18 Okay. So earlier this year in Addendum 11 -- and
19 I won't haul --

20 MR. O'GORMAN: Well, actually, I will haul
21 this one up, Zoom Host. Can we see Registry 313,
22 PDF page 322. And let's zoom in on the top figure.
23 Okay, a little -- yeah, that works.

24 Q MR. O'GORMAN: So we can see -- so this was
25 something you submitted in March. It was updated
26 modelling. And now we see the sulphate line is the

1 orange line on here. There's a logarithmic scale on
2 the right-hand side of that graph, and what this is
3 telling us is that your updated modelling -- now
4 instead of the 500 milligrams per litre that we read
5 about in Mr. DeForest's report from your original EIS a
6 second ago, I mean I see levels that range from 5 to
7 800 and reach a thousand. And I'm just curious if you
8 can confirm that that's what you gave us.

9 A Just -- just a minute, Mr. O'Gorman.

10 Q Okay.

11 A So we're back, Mr. O'Gorman. I apologize for the
12 lengthy discussion. We had talked about greater than
13 500 in the previous answer. This -- this specific
14 graph was made to -- can you hear me?

15 Q M-hm.

16 A Okay. I wasn't sure.

17 This specific graph was made in response to a
18 question about the seasonal -- seasonal nature of
19 sulphate and selenium and the -- whether there would be
20 a seasonal differential between the -- between the two
21 that might put us offside.

22 I -- you know, I -- we agree that these numbers
23 shown in this graph are higher than -- than the
24 previous numbers we discussed, but we would also say
25 that these -- these are based on, you know, both for
26 selenium and for sulphate, some conservative

1 assumptions in the water model balance.

2 Q Okay. Well, of course, we do ask you to provide us
3 with analysis that incorporates conservative
4 assumptions, Mr. Houston.

5 I will put to -- and I don't know if you will know
6 this answer or if one of your experts, but can you
7 confirm that you folks are aware that the current
8 established sulphate guideline for protection of
9 aquatic life is 429 milligrams per litre?

10 A So, Mr. -- yeah, Mr. Davies will respond to that.

11 A MR. DAVIES: Good morning, Mr. O'Gorman.

12 Q Good morning, Mr. Davies. How are you?

13 A Better. Thank you.

14 Q Good. We'll be talking about your -- your resubmitted
15 Nautilus study very shortly, so don't feel lonely.

16 A Oh, I'm not too lonely. No worries.

17 Q Okay.

18 A Yeah. With regard to the guideline for sulphate, it's
19 not quite accurate that the -- that the guideline
20 is 429. The guideline -- and I won't -- I won't refer
21 to the document, but I know the Coalition submitted as
22 their aid to cross the 2018 environmental quality
23 guidelines, and you can look it up in that.

24 The -- the sulphate guideline basically adjusts
25 for hardness up to a hardness of 250 milligrams per
26 litre, and then above 250 milligrams per litre, the

1 guideline itself says you must define a site-specific
2 number. And so the -- and that number, you know,
3 recognizes essentially that this relationship between
4 hardness and sulphate continues above the 250-microgram
5 per litre -- or milligram per litre of hardness and
6 429-milligram per litre sulphate, but it recognizes
7 that there's potential mixture toxicity issues with --
8 with hardness itself when you're trying to understand
9 the effects of sulphate. And so, you know, the
10 guideline asks you to develop a site-specific threshold
11 that reflects the -- the higher hardness but also
12 allows, through that site-specific testing, to assess
13 whether or not the hardness itself is problematic in
14 that water, in that site water.

15 Q Right. It's primarily osmotic stress you'd need to
16 worry about in that case, if I understand correctly; is
17 that right?

18 A Yeah. Like, first, it's -- well, it's a combination of
19 things. I know the -- some of the -- the examples that
20 are cited in the guideline derivation document are
21 specifically oriented towards, you know, high
22 concentrations of calcium and that sort of thing. But
23 overall, when you're looking at sulphate, you are
24 looking at other ions. It's really -- it's the overall
25 osmotic stress. It's the combination of the ions.
26 It's the mixture of the ions that's -- that's overall

1 quite important. The specific composition of
2 individual ions contributes, but it's only a part of
3 the larger story about how that mixture of ions
4 actually behave is -- from a toxicology perspective.

5 Q Okay, Mr. Davies. I actually was going to immediately
6 next talk about hardness and acknowledge some of what
7 you had just said.

8 So, yes, the interaction of sulphate and that
9 guideline, depending on hardness -- I'm sorry, on
10 hardness, is something we'd need to consider, and that
11 sulphate toxicity could be ameliorated by it.

12 And so you folks did do a study of that.

13 MR. O'GORMAN: And, Zoom Host, I'm going to
14 ask you, please, to haul up Registry Document 251.
15 That's Addendum 10. We're going to look at PDF
16 page 67. So if I -- I'm working from memory. I think
17 this was Mr. -- maybe Mr. DeForest's work again, but I
18 might be wrong on that.

19 No, no, sir. This is an IR response, but I think
20 it might have referred to Mr. DeForest's work. Oh, a
21 Nautilus study. My bad. I'm told it was by Nautilus.

22 We're going to look at -- what part of that page
23 am I trying to get you to focus on. If we zoom in --
24 yeah, there we see it. I think the -- right.

25 Q MR. O'GORMAN: So there was some testing done
26 which suggests that for -- the most sensitive endpoints

1 for sulphate were around 700 milligrams per litre of
2 sulphate, and that the species tested tolerated
3 hardness concentrations greater than 834 milligrams per
4 litre with no indication of osmotic stress. Does that
5 look right?

6 A Yes, that's correct.

7 Q Okay. I could haul this up, or I could ask you to
8 confirm that in other documents you submitted to us,
9 you expected to see a predicted hardness in Blairmore
10 Creek to be around 350 milligrams per litre?

11 A Yeah, that's right.

12 And if you're leading -- if I can take a guess at
13 your next question and talk about the difference
14 between these numbers, the difference between these
15 numbers and the predictions for the -- for the creek is
16 that the nature of this study is -- is a spiking study.
17 Essentially what we do is we take site water, and we --
18 we spike it up with, you know, concentrations of -- of
19 sulphate in this case -- up to about 1,500 milligrams
20 per litre sulphate I believe we used in this case, and
21 to try to make sure that the -- the nature of the
22 counterions is consistent with what you see in the
23 creek. That is spiked up with, in this case, a mix of
24 calcium and -- and magnesium as the cations to -- to
25 bring up that sulphate concentration.

26 And, of course, you have -- you can't just add

1 sulphate. You have to add sulphate in solution with
2 some kind of counterions. Otherwise, it won't be
3 dissolved. And so these spiking studies essentially
4 spiked up the hardness to levels that are, you know,
5 well above what you would expect in -- in Blairmore
6 Creek because that was our way to get the -- get the
7 sulphate essentially into -- into the solutions, the
8 test solutions, so that we could test it.

9 So the tests, in that regard, represent a -- a
10 much worse than worst case of hardness and solution
11 relative to -- to the predictions.

12 Q Okay. But you are increasing hardness in Blairmore
13 Creek to about 350?

14 A That's my understanding, yeah.

15 Q Okay. And you agree, I'm guessing -- and this might be
16 you, Mr. Davies; it might be Mr. Bettles. I'm guessing
17 it's you -- that increased hardness could result in
18 calcite formation in Blairmore Creek?

19 A MR. BETTLES: Mr. O'Gorman, that might be,
20 actually, a question for Mr. Day. I'm not a hundred
21 percent sure. Steve Day?

22 A MR. DAY: Yeah, I could -- sorry, yes, I
23 could answer.

24 I mean, so there will be -- I mean, there will be
25 enough calcium in the water to -- so that we have to
26 think about calcites formation, precipitation from the

1 water. But maybe -- so I'm going to push this to --
2 just to Mr. Jensen. Maybe you could speak to how --
3 how the effect of -- if we have to treat that, what
4 that would -- what that effect would be.

5 A MR. JENSEN: Yeah. So I wonder -- I
6 apologize. I did lose track of the exact question in
7 the go-around here.

8 Q Well, I'll suggest to you -- I appreciate that,
9 Mr. Day, and if you really want to talk about calcite
10 treatment now, you can, but this isn't where I'm going
11 with my questions right now. I think I will
12 probably -- might return to ask a bit more about
13 calcite formation later, but maybe we should return to
14 that idea later if we need to. Does that work for you?
15 Okay. It's not immediately relevant.

16 We're asking a general question of: Can increased
17 hardness lead to calcite formation? I think the answer
18 to that is generally yes; correct?

19 A MR. DAY: I can answer that. Yes, that
20 will be the case.

21 Q Okay. That's all I really wanted to know there. We're
22 going to return to it.

23 All right. So I just want to confirm: Based on
24 some of these numbers that we've looked at and your new
25 modelling predictions that would be -- admittedly,
26 they're seasonal, Mr. Houston, but they did reach

1 significantly higher levels of sulphates projected than
2 we were -- we saw four years ago in your initial work.

3 So if we were, as a Panel, to endorse the
4 site-specific selenium guideline, that would mean that
5 sulphate would have to be maintained above a certain
6 concentration to ensure that it's always above your
7 predicted -- your predicted selenium levels; is that
8 right? In Blairmore Creek, in particular.

9 A MR. HOUSTON: As we talked about before, the
10 two tend to go hand in hand, yes.

11 Q Right. In particular, you would need to maintain high
12 sulphate levels to ensure that selenium stayed below
13 it, below the sulphate?

14 A I -- I would say we -- we would want to avoid reducing
15 the sulphate levels to -- to a level that would impinge
16 on the selenium objective, yes.

17 Q Okay. And we looked at the study that you referred to
18 in the IR response that I hauled up that suggested
19 concentrations of sulphate of about 700 milligrams per
20 litre for those most sensitive endpoints could be
21 tolerated with few effects, but it would need to be
22 confirmed through your aquatics monitoring program; is
23 that correct?

24 A Yes.

25 Q Okay. And so if we look at the graph --

26 MR. O'GORMAN: We can maybe, Zoom Host, go

1 back to the figure that I asked as to -- the 313,
2 PDF 322.

3 Q MR. O'GORMAN: And considering that the study
4 referred to in your IR response showing potential --
5 you know, up to 700 sulphates you were good with, but
6 we potentially might see quite higher than that here,
7 how would that -- what would these levels of sulphates
8 potentially impact aquatic organisms in Blairmore
9 Creek --

10 A MR. DAVIES: And I --

11 Q -- (INDISCERNIBLE - OVERLAPPING SPEAKERS) expert
12 ideally?

13 A I can speak to that.

14 A MR. JENSEN: May I -- if I may,
15 Mr. O'Gorman, the -- the numbers you see represented
16 here -- the model results you see represented here,
17 they -- they represent an added level of conservatism
18 over and above the numbers we issued that were based
19 on -- on closer to average conditions.

20 The reason we use average conditions for water
21 quality model results in general is that for a number
22 of the source terms, they're derived based on -- on
23 precipitation and percolation rates that are average.
24 So that means that the source term -- the source terms
25 are, you know, developed on that basis.

26 So when we start to move away from that basis in

1 our -- in our model results, we're generally hesitant
2 about doing that for this precise reason, that it -- it
3 does -- you know, strictly speaking, we should be
4 developing sources now for every level of -- of
5 precipitation and percolation rates.

6 So I don't want to get into the weeds on this, but
7 I will -- I will say that there's a reason why we
8 didn't -- we didn't present numbers this way in the
9 first place, and it is that it adds an extra level of
10 conservatism that, you know -- we -- that we're not
11 necessarily -- I don't know what the right word is, but
12 it -- it's not the level of conservatism we would
13 choose and consider to be necessarily appropriate.

14 Q And if we -- yes. Actually, I was going say: And if
15 we saw these levels of sulphates in Blairmore Creek,
16 what do you -- how do you think the -- the little
17 critters in there would respond?

18 A MR. DAVIES: Yeah. Well, the key -- the
19 key life stage of concern with regard to sulphate here
20 would be trout eggs, you know, leading to -- basically,
21 the -- the egg to -- to fry stage. Those are sort of
22 the anchors for the test. And those, I think, are, you
23 know, an important part of -- of, you know, protecting
24 Blairmore Creek.

25 So when you look at the -- the variation you see
26 in this graph, I know it's a -- all these things are

1 full of log scales, which are really hard to interpret
2 on the fly, but essentially these concentrations are
3 predicted to vary here in this graph from about -- it
4 looks like about -- you know, once you're up towards
5 the top, about kind of 450, 500, something like that,
6 up -- at the -- the end of mine life, anyway, there,
7 they go up to around a thousand.

8 And the -- the numbers near the top reflect low
9 flows. The numbers at the bottom would reflect high
10 flows; right? Like, there's more dilution available at
11 high flows and less at low flows.

12 For -- for trout in the stream -- and I'm thinking
13 king of cutthroat trout and rainbow trout -- they're
14 spring spawners. They -- you would expect to see the
15 most kind of critical period for exposure of -- of eggs
16 in gravels to be from kind of, you know, June-ish, if I
17 understand correctly, that -- Mr. Bettles could confirm
18 for me here, but my understanding would be from kind of
19 June-ish to early August. And at that period of time,
20 we're on kind of the falling leg of the hydro graph
21 from the -- from high flows, working our way towards
22 low flows.

23 So the most sensitive species in life stage to --
24 to sulphate would -- would likely be exposed to the
25 lower end of these -- these numbers that are predicted
26 here.

1 I would also say about the tests, as -- as you
2 pointed out earlier, the -- the hardness in those tests
3 was very high. And there might be some ways to repeat
4 those -- you know, repeat the site-specific test for
5 sulphate with a different set of counterions to try to
6 more accurately reflect the -- the expected hardness
7 level, like, you know, using sodium sulphate or
8 something like that to try to get a more precise number
9 for exactly this case. But when you look overall at
10 the concentrations, the -- the fish, in particular,
11 are, you know, outside of the egg stage, are quite --
12 and I'd say salmonids, you know, specifically are --
13 they're quite tolerate of sulphate. I think that may
14 be because rainbow trout, cutthroat trout are, you
15 know, part of the same genus as -- as specific salmon,
16 right, and they're -- they're sort of, you know, built
17 to manage osmotic stress by going to the ocean where
18 it's, you know, obviously quite salty.

19 But the -- I -- I would say, though, that the
20 concentrations in those couple years near the end of
21 mine life are important ones to pay attention to, and
22 there would need to be a close look at -- you know, if
23 we're moving towards that and we are finding that the
24 concentrations are moving up into this range, then, you
25 know, you don't want to just take it for granted that
26 everything's fine. You want to keep watching fairly

1 closely. If that's -- if that's helpful.

2 Q Sure. That is helpful, Mr. Davies. Thank you.

3 And I want to draw our eyes to one other thing,
4 and I -- if I suggested to you that the sulphate levels
5 today in Blairmore Creek are about 20 milligrams per
6 litre, I think people would agree with that; right?

7 A It's around that, yeah.

8 Q Yeah. So we're looking at a substantive increase in
9 projected sulphate levels in Blairmore Creek.

10 I wonder if other sources -- and, Mr. Davies, this
11 is a question for you -- that might trigger other
12 unexpected or unforeseen sorts of reactions, like a
13 change in the makeup of the life that lives there to
14 different algae and bacteria and fish food that is more
15 adjusted to invertebrates that are more adjusted to
16 high sulphate levels rather than what -- the levels
17 they experience today?

18 A Well, in my experience, like, I've seen a lot of mine
19 sites that have relatively high sulphate concentrations
20 in their creeks. It's -- it's one of the sort of
21 ironies of there not being a sulphate guideline until
22 recently, is that because people didn't tend to look at
23 it, the -- you know, you ended up having high numbers
24 in quite -- quite a lot of places.

25 And so we've done a lot of environmental effects
26 monitoring looking at -- looking at effects in, like,

1 benthic communities, benthic invertebrate communities,
2 or periphyton communities, fish communities, in small
3 streams that have experienced this kind of change in --
4 in sulphate concentrations.

5 And, honestly, I'm trying to -- I want to make
6 sure I'm speaking clearly here. In the -- in all that
7 monitoring -- and that's -- I don't know. That's
8 20-odd years of monitoring around mine sites -- we have
9 seen effects of -- that we suspect are related to
10 either sulphate or -- or TDS, like, total dissolved
11 solids, just the overall effect of -- of, you know, ion
12 load in -- in these small streams, but we -- we've seen
13 them at concentrations up above a thousand. Like, we
14 generally don't see effects on benthic invertebrate
15 communities, generally don't see effects on -- you
16 know, often it's -- it's juvenile salmonids that are
17 using these -- these systems 'cause they're -- they're
18 very small systems, and they're using them for spawning
19 and rearing, but then they move out as adults into
20 lakes or larger rivers.

21 We -- like I said, we do see it occasionally, but
22 it's -- it's actually not that common, in my
23 experience. It's not to say it doesn't happen. I
24 don't know if that's too waffly an answer for you, but
25 it's sort of my experience over -- you know, over
26 several years of monitoring.

1 Q Okay. Well, I'll -- I'll accept that, and we'll move
2 on.

3 So the sulphate and the selenium have this mutual
4 interdependence in what your -- in your proposal where
5 the selenium levels, I'll characterize it as, are
6 acceptable because the sulphate levels are high. So,
7 Mr. Houston, you might want to confirm: That's a
8 general interpretation that -- that you agree with?

9 A MR. HOUSTON: Yes. I -- I would point out
10 that with very few exceptions, there's some -- some
11 space between those -- those two. So there is some
12 allowance for the sulphate levels to be lower and still
13 be -- still create a site-specific guideline that is --
14 is protective.

15 Q Okay. And in a similar sense, the higher sulphate
16 level -- you're suggesting to us that the higher
17 sulphate levels are okay because you're having higher
18 hardness levels; is that also something you agree
19 with that you are --

20 A Yes.

21 Q -- you are proposing? Okay.

22 A Yes.

23 Q And calcite -- potential for calcite formation, as a
24 result of the higher levels, is at least a potential
25 concern?

26 A On that one I'm going to have to defer to maybe

1 Mr. Day.

2 A MR. DAY: Yes, yes, that's correct. I
3 agree with that, yeah.

4 Q So if we were concerned about the hardness levels and
5 the calcification and we or some future regulator said
6 that you've got to bring those hardness levels down,
7 does the chain of effects cascade back to lower
8 hardness? Now you are more worried about sulphates;
9 better bring the sulphates down. Now you are more
10 worried about selenium; better bring the selenium down.
11 Are those all interacted in that way? Is that a fair
12 way to characterize it?

13 A MR. DAVIES: Yeah. With respect to the
14 interaction between the -- the toxicities that -- that
15 we're concerned about, I would say that that is a -- a
16 fair way to characterize it, with sulphate, I'd say,
17 being the -- the key -- you know, the key variable in
18 all of that, honestly.

19 Q Okay. This is a bit of a -- well, do you have much
20 sense of the buffer that exists in that complex web of
21 relationships between all these different sorts of
22 impacts that might be triggered in Blairmore Creek
23 of -- I recognize it's a -- kind of a qualitative
24 question, and I'll let you react. Is there lots of
25 leeway in these relationships where you can fine-tune
26 any one of those hardness, sulphate, selenium,

1 potential calcite, down by up to 25 percent and not
2 worry about it negatively impacting the other
3 component -- the effects of the other component that
4 it's related to? Like, are all of these very tightly
5 linked? Is there a lot of wiggle room? Do you have a
6 sense of that?

7 A MR. HOUSTON: So can we just have a little
8 conference here before we give you an answer to that,
9 Mr. O'Gorman?

10 Thank you.

11 Q By all means. And I'll acknowledge, I'm not giving you
12 a strict, but conceptual question.

13 A Under -- understood.

14 Okay. Go ahead.

15 A MR. DAVIES: I'm sorry, Mr. O'Gorman.

16 Yeah. There's two -- two kind of steps to
17 consider here. There's the relationship between
18 hardness and sulphate and the relationship between
19 sulphate and -- and selenium.

20 I'll start with the sulphate and the selenium.
21 The -- as you can see in the -- in the site-specific
22 objective, the concentrations of -- of sulphate that
23 kind of drive the -- the objective up to levels that
24 are -- that are protective of what's predicted are up
25 to about 300, you know, something like that, 400. So
26 we've got a fair scope, if -- if sulphate was brought

1 down, to still -- you know, for that -- sorry, for that
2 selenium guideline -- or selenium objective to still be
3 protective.

4 And I know we haven't talked about this, but
5 there's -- I don't think there's an assumption that the
6 selenium objective, if adopted, would just, you know,
7 go up indefinitely with -- with sulphate concentrations
8 either. So you might want to cap it at some point.

9 With regard to hardness and sulphate, as I was
10 talking about earlier, the sulphate needs a counterion,
11 and the hardness needs a counterion; right? You can't
12 have -- you can't really have one without the other.
13 And so if -- if there was a treatment going on for one
14 or -- you know, for sulphate, you would, by necessity,
15 be pushing down the hardness.

16 And I -- I believe that -- that the same would be
17 true for -- for hardness and sulphate.

18 But maybe I'll flip that over to Mr. Jensen.

19 A MR. JENSEN: Yeah, that's correct. And
20 when we look at -- at sulphate and hardness of sulphate
21 and -- they do go hand in hand. So if you -- in fact,
22 I've done this analysis for a number of sites and
23 looking at the site-specific guidelines and, you
24 know -- so when we look at -- at things like sulphate
25 removal and, say, an eight years lime plant, reducing
26 the hardness and the sulphate, they go hand in hand to

1 the point where the ratios stay above the guideline
2 limits. So as you reduce hardness, you -- you're never
3 in a situation where, all of a sudden, sulphate becomes
4 an issue because the corresponding reduction in
5 sulphate always stay above that sort of stepwise
6 guideline that's been defined.

7 So it's in -- from that perspective, it's -- they
8 inherently go together. So in terms of buffer, yeah, I
9 mean, I'd say it's more than a buffer. It's -- it's
10 just sort of an inherent relationship, if that helps.

11 Q And I suppose -- sure. And I suppose we have to also
12 look at it and think about -- and this graph does
13 illustrate, on top of these three interlinked
14 components and potential impacts on the water, the
15 seasonality aspects. Sometimes flows are high, and
16 sometimes flows are low, and concentrations vary
17 accordingly; right?

18 A MR. DAVIES: Yeah, that's correct.
19 Although I think that the -- for the things that we're
20 most concerned about, sulphate, hardness, and -- and
21 selenium, like, the signal, I believe, in the creek is
22 coming mostly from the effluent. And so if they're
23 varying -- if they're consistent in the effluent, then,
24 you know, mostly what you're dealing with in the creek
25 is -- is, you know, concentrations moving up or down
26 with dilution from ambient creek flow.

1 Q Okay. Okay. Great. Let's go to my next group of
2 questions, which are more explicitly about the proposed
3 sulphate-adjusted, site-specific water quality
4 objective for selenium.

5 MR. O'GORMAN: I'm going to refer to a
6 document. We can take those down, Zoom Host.

7 And my first document let's not bring up, but I
8 will refer to it.

9 Q MR. O'GORMAN: In Addendum 10, Registry
10 Doc 251 on PDF page 10, these were IR responses.
11 Actually, I suppose that would have been -- if it's
12 Addendum 10, that would have been Package 5. And I
13 didn't write that down.

14 You did tell us that the site-specific guideline
15 is intended to be a preliminary benchmark for assessing
16 whether modelled selenium concentrations may pose an
17 unacceptable risk to fish as represented by westslope
18 cutthroat trout in Blairmore Creek, and once mining
19 commences, monitoring data will be evaluated relative
20 to the Blairmore Creek -- Blairmore Creek water quality
21 guideline used to validate the guideline that was
22 involved. And, if needed, an updated site-specific
23 objective may be developed in the future from
24 monitoring data. Do you agree that you said that to
25 us?

26 A MR. HOUSTON: So my understanding, where

1 we've got "BC water quality guideline", that that means
2 the province of BC, not Blairmore Creek.

3 Q Oh. Okay. Right. Sorry. I read it wrong.

4 A But other than that -- other than that, you did very
5 well.

6 Q I struggled a number of times through this process
7 knowing -- flipping back and forth between abbreviating
8 BC and what was meant because they obviously are so
9 relevant and next door to each other. So my bad.

10 Okay. Thank you, Mr. Houston.

11 So now we have some questions about -- about the
12 approach to this guideline. So are we correct --
13 correct in assuming that while site-specific
14 information on current selenium and sulphate
15 concentrations is available to refine the proposed
16 guideline, collection of data, such as water quality
17 and selenium tissue concentrations, would be required
18 while the concentrations of selenium and sulphate rise
19 in Blairmore Creek?

20 A MR. DAVIES: Yeah, I think so. And
21 it's -- I don't think it's just a matter of collecting
22 data. Like, one of the challenges, I think, for this
23 project -- it's -- it's sort of a mixed blessing -- is
24 that the concentrations of selenium aren't really
25 projected to increase in the creek for several years.
26 And so if we're trying to do -- you know, collect more

1 data from biota for, you know, accumulation modelling
2 and that sort of thing, we're dealing with several
3 years of -- of the current situation. And the
4 challenge with building a model, if you are trying to
5 project forward, is that if you only have, you know,
6 your baseline data, you know, it doesn't -- more data
7 doesn't necessarily give -- it gives you more
8 confidence and precision in what's going on in the
9 creek right now, which -- it is important, and we do
10 need to monitor that and collect a broader baseline for
11 that, but it doesn't necessarily help you with your --
12 with your projections going forward.

13 That said, though, I do think that there are some
14 more opportunities here to -- to, you know, further
15 validate the -- the model that was developed.

16 There's -- you know, there's stream side. You know,
17 there's experiments you could do to -- you know, with
18 experimental troughs or these sorts of things in the
19 early days of -- of mine life to, you know, further
20 describe the relationships that -- that we're talking
21 about here in the -- in the guide -- in the objective.

22 And also, obviously, if the mine does move to a --
23 or when -- when the mine moves to a -- like, the pilot
24 SBZ, you would hope that there would be an opportunity
25 to, you know, do some tests -- direct testing with
26 that -- that effluent looking at these relationships.

1 Q So, Mr. Davies or Mr. Houston, maybe, are you folks
2 committing to implementing a plan for how you are going
3 to monitor the various constituents needed to update on
4 an ongoing -- you know, monitor and update the proposed
5 guideline that you have put in front of us?

6 A MR. HOUSTON: We -- we have filed a draft
7 aquatics monitoring plan, and it contains most of the
8 components we've been talking about, Mr. O'Gorman.

9 And, of course, we're -- we're ready to work
10 directly with the regulators to fine-tune that plan
11 and -- and finalize it. So we are committing to a
12 monitoring plan, yes.

13 A MR. DAVIES: Mr. O'Gorman, if I can expand
14 on that a little bit.

15 Q Okay.

16 A Sorry. Yeah. If I could expand on that a little bit,
17 the draft aquatics monitoring plan right now is -- it's
18 quite high level, obviously, and that's, you know,
19 intentional; right? We don't have a, you know,
20 specific discharge point. We -- there's a lot --
21 there's a lot to still sort out, and -- and, you know,
22 it -- it's part of the detailed design process, I would
23 say, is -- is in tuning this in and figuring out not
24 only what needs to be monitored going forward but what
25 other data, you know, should be put together to support
26 the -- you know, the -- the effects predictions that --

1 that have been made.

2 And my experience with -- with that is that the
3 best process for that is really kind of workshopping it
4 through -- through a process with regulators
5 potentially bringing in others like the -- all of your
6 AER and ECCC colleagues behind the curtain have lots of
7 experience with -- you know, with this and -- and
8 expertise. And I would think that we would want to do
9 that very early on in the process, is -- is set up a --
10 a -- a process to -- to define what this monitoring
11 should look like because the monitoring shouldn't just
12 be monitoring. It should be really designed to collect
13 data that can feed back directly to management; right?
14 Like, that's why you should monitor, and this would be
15 part of that.

16 Q Okay. So, Mr. Davies, I think from what you said, you
17 would agree if I were to suggest to you that your
18 current draft aquatics management plan does not really
19 contain the kinds of information you'd need for how
20 you're going to update the site-specific water quality
21 objective?

22 A Yeah. Absolutely, I would.

23 Q Okay. Okay. Thanks for that.

24 I'm going to jump to the undertaking results that
25 you filed, please, which --

26 MR. O'GORMAN: Zoom Host, this is CIAR 878.

1 So while it's coming up -- and thank you all for
2 turning this around so quickly -- I will -- and we're
3 going to go to page PDF 14, please.

4 Definitely -- and let's blow up the figure at the
5 bottom of the screen, yeah, and blow it up and go down
6 to the bottom. Maybe blow it up one more time so we
7 can have a good look at those numbers and that -- those
8 data points.

9 Q MR. O'GORMAN: Okay. Yes. Thanks for
10 returning the undertaking in as quick a time as you
11 did. We've given a quick check through the numbers and
12 the figures. We don't have any real disagreements,
13 maybe with some rounding errors. And I think I will
14 suggest to you that you'd agree with me if I said that
15 there was more a -- transcription errors than anything
16 else and that your recalculations don't have a large
17 impact on the previously submitted results. Is that a
18 fair way to characterize this response?

19 A MR. DAVIES: Yeah, definitely, I would
20 agree with that.

21 Q Okay. I think we've agreed that you are -- through the
22 conversation we just had a few minutes ago, but I'll
23 ask you to be clear. Are you proposing -- so all of
24 this -- these results end up with a suggested --
25 sulphate-adjusted, selenium site-specific water quality
26 objective. Are you asking this panel to accept this

1 SSWQO or a WW -- SSWQO, i.e., these particular numbers
2 or the concept of one?

3 A Yeah. I can speak to it technically. I obviously
4 can't speak on behalf of Benga, but I -- technically,
5 what we've done here, I think, is -- is demonstrate
6 that there is a clear and consistent relationship
7 between -- between sulphate and -- and, you know, kind
8 of a -- and -- and selenium uptake into the food chain,
9 if I can be precise that way. This doesn't consider
10 the nature of the environment that it's discharging to,
11 and that's meant -- that's on purpose, right, the --
12 that that kind of adds to the conservatism because we
13 are discharging to a lotic environment.

14 But when you specifically look at what should be
15 adopted as an objective, I think there's a lot of other
16 issues to consider. And one of them is, honestly, just
17 the -- sort of the practicality of it, from a -- from a
18 day-to-day operational perspective, that, you know, if
19 you have a -- if you have an objective that is -- that
20 requires an extra number to calculate it every time
21 you -- you want to assess it -- that's both at the mine
22 site and by regulators -- it does -- you know, it does
23 make it a little bit more finicky. And I have seen
24 situations where a -- you know, a relationship is made
25 clear. A -- and then in the end, a -- a -- a single
26 number is set that essentially, you know, captures that

1 relationship but makes it much easier for regulators to
2 assess attainment and, you know, mine operators to
3 assess attainment and that sort of thing.

4 If you want to be very precise about it, then I
5 think this relationship is a -- is a good foundation
6 for a -- a -- a selenium objective in the creek that
7 specifically refers to sulphate. It's not -- this is
8 not an uncommon approach. Metals and -- and hardness
9 go along with this all the time. But I do think that
10 that whole framework around the -- the objective is an
11 important thing to, you know, consider practically
12 and -- and sort of logistically.

13 So I hope I haven't muddied the waters with that,
14 but from a technical perspective, I'm -- I'm not wedded
15 to the line. I don't think that's necessarily the most
16 important thing. It's -- it's how this relationship is
17 captured within a -- a protective objective for the
18 creek.

19 A MR. HOUSTON: If I could, Mr. O'Gorman, I
20 tend to agree with my -- my colleague Mr. Davies. We
21 understand that this -- the science that demonstrates
22 the protective nature of what we're proposing needs to
23 be translated into something that could be useful both
24 from an operating management perspective and -- and a
25 regular -- regulatory perspective. So we would fully
26 expect that there would be some interpretation of the

1 results and then something -- some objective set down
2 that's perhaps simpler to implement.

3 Q Okay. Thanks, Mr. Houston.

4 Okay. So I want to -- I'm going to -- so -- and,
5 Mr. Davies, this will primarily be for you. I'm going
6 to suggest something, in the interest of time, and ask
7 you to agree with it and -- for the sake of, you know,
8 everyone's understanding.

9 This is a figure that shows on the y-axis and, you
10 know, enrichment function is plotted, which is a --
11 basically a level of how much selenium uptake occurs in
12 the tissues divided by their concentration, and
13 compared to on the x-axis, increasing sulphate
14 concentration values, it shows tests that you did for
15 particularly -- well, they're not listed for you. For
16 an algae species, *P. subcapitata*; yes? Yes,
17 Mr. Davies?

18 A MR. DAVIES: Oh, sorry. Yes, I agree.
19 Yes.

20 Q And the key -- you know, well, maybe there are a number
21 of keys, but, like, arguably, the most important piece
22 of information that you pull out of this graph for
23 future use in your objective is the slope -- sorry, the
24 exponent on the 'X' value in your best-fit regression
25 curve, that slope ends up being used later in the -- in
26 the objective; right?

1 A Yes. Exactly.

2 Q Right. So the regression best fit of that line we see,
3 to guide our eyes, is really the thing you're trying to
4 draw from this graph, from this plot?

5 A True. Yes.

6 MR. O'GORMAN: Okay. And, Zoom Host, can we
7 scan two pages down to see Figure 4? And I just want
8 to establish down at the bottom -- you don't have to
9 zoom in.

10 Q MR. O'GORMAN: So this looks very similar.
11 It is for a different species, Lemna minor, but it's
12 enrichment function versus sulphate. You do a
13 regression analysis. The slope of, again, the 'X'
14 curve, actually, you don't use in your objective. I
15 think you only average the two algae species; is that
16 right?

17 A Yeah. Yeah. And the purpose for that is that there
18 aren't really aquatic plants in Blairmore Creek. There
19 is only periphyton, which will be allable [phonetic]
20 species.

21 Q Okay. And so drawing your eye to it, we see on the
22 very low sulphate region one high point and then a --
23 you know, four other data points in the -- you know,
24 ranging from, you know, 2 to 7 -- 600-ish kind of
25 concentration that are all clustered lower; right?

26 A Correct.

1 MR. O'GORMAN: And we'll see the same
2 relationships two pages later, Zoom Host, on Figure 6.

3 Q MR. O'GORMAN: And this was for a different
4 algae species, if you scan down, *S. acutus*, and we see
5 the same sort of relationship in this. This one, you
6 do use the exponent on the 'X' to get the -- your
7 current version of the objective; right?

8 A Correct.

9 Q Okay. So let's talk about these figures. And this one
10 works as well as any other 'cause I think we agree they
11 all basically show a very similar relationship.

12 So if you were an average person on the street who
13 knew a little bit about data but didn't know much about
14 selenium uptake in the tissues, do you think it's fair
15 to say that you'd look at these five points on a graph
16 and say, Well, you've got one really high one at this
17 very low value of whatever it is you are measuring on
18 the x-axis, and then once the x-axis gets -- once you
19 get into, you know, above the very beginning of the
20 graph, the other four results are all very similar and
21 clustered in terms of where they are on the y-axis; is
22 that something that you'd think would be reasonable to
23 think from looking at this?

24 A Yeah. I think that's especially fair for the
25 *Scenedesmus* result here that we're looking at, but it
26 is true for all three.

1 Q I think all three sort of show one very initial, very
2 high point, and then four that are not too dissimilar
3 from each other at anything above the very lowest
4 concentrations; right?

5 A True.

6 Q Okay. So you, of course, fit a regression analysis to
7 these five data points and get very important data out
8 of it, the exponent on that 'X' curve -- sorry, the
9 exponent that we see above the 'X'. Would you agree
10 that that one initial very high point is of
11 overwhelming importance in dragging that curve, if you
12 will, the regression analysis, to -- to give you your
13 results on the shape of that curve and the slope of
14 that curve?

15 A Yeah, we would say that it has a high leverage at that
16 point there.

17 Q If we want to get technical, we would say it has high
18 leverage. But it is a -- it's a very important point
19 compared to the others, because if that one point was
20 lower, the entire curve would get -- would look very
21 different, and ...

22 Okay. So one of the things that someone might
23 think when they look at this -- this very important set
24 of data -- although there's five points -- is if I
25 wanted to really flesh out this relationship, would I
26 maybe want to better explore that region of the graph

1 and get more data points to really know what that curve
2 looks like instead of relying on just one data point?

3 Does that --

4 A Yeah. I --

5 Q Is that something that would be fair to think if I
6 looked at this?

7 A Yeah, that would certainly be fair. I think that the
8 experience that, you know, all of us have working with
9 bioassay data is that setting the -- you know, you're
10 setting the doses in your trial ahead of time, before
11 you exactly know what the response is going to be, and
12 you -- you know, there's always -- there's endless
13 debates about curve fitting. But fundamentally, if you
14 wanted to more precisely define this relationship,
15 then, yeah, you could rerun these tests with a much
16 larger number of series of dilutions and dose
17 responses.

18 Q Yes.

19 A MR. HOUSTON: Can we just --

20 Q Go ahead.

21 A Can we just have a little consultation because I have
22 another thought?

23 Q Sure.

24 A So I -- maybe this is the difference between the -- an
25 engineer and, I guess, more of a scientist. For me, I
26 was -- and what we were just debating, Mr. O'Gorman, is

1 our -- what we've stated is we're going to operate in
2 that 200-plus range. I'm just picking 200-plus because
3 it seems to be a place on the curve where -- and an
4 engineer to -- to simplify this, because we don't
5 understand all these fancy numbers, would -- might say
6 that, you know, we could approximate that lower part of
7 the curve as being linear, irrespective of the leverage
8 of the first point, and if you got a whole bunch more
9 points in there, you would still end up with an
10 approximately linear relationship at the lower part of
11 the curve if you -- if you did the fitting right. And
12 that's where, I think, we're -- we're hoping to be
13 operating.

14 So I -- I'm just questioning the value of doing a
15 lot more research to get that back end of the curve
16 between 0 and 100 more precise if we all agree that
17 between 200 and let's say 500, we're looking at more or
18 less a linear relationship, or we could fit a linear
19 function in there just as easily.

20 Q Yeah. If you eyeball it, I'm not -- I would not
21 disagree with that for all of these figures. The four
22 data points that are not in the very low sulphate
23 region all give you very similar values of enrichment
24 function. So one of the ways you might react to that
25 is to scratch your head and say, So why go to all the
26 trouble of fitting -- of coming up with a sulphate

1 adjusted curve when basically, at whatever level of
2 sulphate, you get a very similar enrichment function?

3 A MR. DAVIES: I suppose -- if I could
4 respond to that, Mr. O'Gorman.

5 The -- it is quite consistent when you're up at
6 these higher concentrations of sulphate, but when we're
7 looking at -- you know, what we're trying to do with
8 this slope, essentially, is figure out how -- how that
9 sulphate may -- and how -- yeah, how does the -- the
10 changes in sulphate may -- may relate -- like, sorry.
11 Let me compose my thoughts briefly here.

12 Like, right now we have -- the Alberta generic
13 guideline is 2 micrograms per litre. It comes from the
14 BC guideline. The BC guideline derivation is -- you
15 know, it's -- it's an interesting derivation. It's
16 quite different than -- than your typical guideline
17 derivations because it -- selenium acts very
18 differently in the environment. We're not concerned
19 about, you know, toxicity through the gills or anything
20 like that. Like, the issues with selenium are really
21 uptake in the food chain and accumulation in fish. And
22 so there's -- there's sort of multiple
23 considerations -- like, three considerations that --
24 that we need to think about: the concentration in
25 water, the uptake into the food chain, and the
26 potential for accumulation within the food chain in --

1 in kind of slow-flowing, highly sedimentary
2 environments.

3 So when you look at the derivation of the
4 guideline, it states numerous places that
5 concentrations of selenium in water are a very poor
6 predictor of effects because of these two other issues
7 on top of concentration that really drive a lot of
8 these issues around bioaccumulation.

9 And so the way they derive this
10 2-microgram-per-litre level is they -- they kind of
11 broadly scan literature and they broadly scan
12 background concentrations, and they sort of say, Well,
13 2 -- 2 looks to be broadly protective of -- of lentic,
14 so slow-moving environments in -- in all cases.

15 And so when -- when we're looking at -- at this
16 from the perspective of an assessment, this is not a
17 lentic environment, and this is not an environment
18 that -- like, this will not be a high-sulphate -- or a
19 low-sulphate environment. And we know that those two
20 things do -- and if you kind of think of them as sort
21 of sliders that affect the -- the safe concentration of
22 selenium in a creek, what we've done with this is we
23 know that the sulphate will be higher, and so to
24 properly capture that mixture-based potential for
25 effects, we've tried to model that out. And -- and,
26 you know, we -- so this -- this site-specific objective

1 that's proposed, the intent of taking the slopes, as
2 you will have seen through the document, is to
3 essentially understand how uptake into the food chain
4 would change with increasing sulphate. And then, you
5 know, we make -- we make some critical assumptions that
6 the 2-microgram-per-litre level that's been set in the
7 guideline is protective in low-sulphate environments.
8 And then we extend, you know, using the slopes of these
9 relationships, essentially, that -- that 2-microgram
10 per litre value up with increasing sulphate
11 concentrations because we know that those increasing
12 sulphate concentrations will keep the rate of uptake
13 into the food chain consistent.

14 And so one way to look at the site-specific
15 objective is that it's essentially the equivalent of
16 that broadly protective 2-microgram-per-litre guideline
17 for lentic environments that has been kind of slid up
18 to reflect the sulphate concentration, and it's meant
19 to reflect the same -- the same amount of movement into
20 the food chain that you would see, you know, in a -- if
21 you were applying a 2-microgram-per-litre level. And
22 that's why the -- the objective at these low
23 concentrations of sulphate is the same as the -- as the
24 provincial guideline.

25 We don't consider that second slider between
26 lentic and lotic environments, slow flowing and fast

1 flowing environments, at all. We leave that out of the
2 consideration. And -- and so what we're doing is
3 essentially sliding up a -- a lentic guideline to -- to
4 an objective value that we think is still reflective of
5 that lentic 2 microgram per litre. It just ends up
6 being higher because there's more sulphate.

7 But we -- we aren't taking into consideration at
8 all that Blairmore Creek itself is not a -- an
9 environment that is prone to accumulate selenium.

10 And I could reference figures and bring this stuff
11 up, but I know we're -- it's Saturday, and everybody
12 wants to go home, so I will -- I'll just, you know, say
13 that if you do want to go to the fluvial geomorphology
14 report in Appendix 2, you can see we have excellent --
15 like, uncommonly detailed creek morphology information
16 for -- for these creeks because of the Fisheries
17 concerns on the project. And you can see that -- that
18 it is a purely lotic environment, and so you don't
19 expect to see a -- you know, an equilibrium between
20 selenate and selenite that moves towards selenite. You
21 don't expect to see accumulation in sediments. And you
22 don't expect to see that cycling that would accumulate
23 higher and higher concentrations of selenium in the
24 food web.

25 And so, like, that -- I guess the -- the rationale
26 for it is that, you know, we have a -- a generic

1 guideline that we know is not representative of this
2 environment. We know that we can describe one of those
3 relationships that -- that modifies the behaviour of
4 selenium and the uptake of selenium into the food web
5 in this receiving environment, and so we're trying to
6 reflect that in the -- in the assessment that we've
7 made.

8 And as I -- as I've said before, you know, we're
9 quite confident in -- in these relationships. They're
10 very -- like, between the three species, they're very
11 consistent. And I know we have, you know, highly
12 reaching that one data point, but that one data point
13 is generally consisting across three different tests of
14 three different species as well, and it's consistent
15 with quite a large body of literature. And
16 Mr. DeForest could speak to that, if you like.

17 But essentially what we're trying to do is
18 there's -- there's those two key sliders, and we're
19 trying to, you know, basically use one of them to
20 understand how sulphate would -- would -- would change
21 the -- kind of the critical concentrations of -- of
22 selenium in the environment that would lead to
23 accumulation in the food web that you would be worried
24 about.

25 Q Okay. Thank you, Mr. Davies.

26 I won't sort of try and hit on all of those points

1 in your response. I think we've established a couple
2 of things that I did want us to establish about these
3 curves and the importance of the slope that comes out
4 of these curves for the guideline that you have
5 presented.

6 I've asked you about the paucity of data in the
7 low sulphate regime that would be better to define this
8 curve. I also point out that all of the tests -- you
9 know, they're all different, but they all have a -- the
10 highest value of sulphates that were tested are all
11 around 600 milligrams per litre.

12 I'm sure we can recall 15 minutes ago or so, we
13 looked at some of the projected values of sulphates you
14 might see that could potentially, admittedly, as you
15 describe it, a conservative case, reach up to and above
16 a thousand milligrams per litre. So we are wondering
17 about why you don't have more data in that higher
18 sulphate regime to help further define what the
19 relationship might look like.

20 Do you have any sense of why you -- also, as well
21 as not further exploring the low sulphate regime, you
22 haven't further explored the high sulphate regime?

23 A Well, I'd say part of it is that those -- those higher
24 sulphate numbers came along after these trials.

25 But I would say that the -- like, these are not
26 really complex tests; right? Like, they are -- they

1 are repeatable, and they are -- they can be extended,
2 you know, relatively quickly.

3 So it's -- if it is something that, you know,
4 regulators want some more confidence about, it's not a
5 challenging thing to do to extend those tests.

6 Q Okay. Is there a possibility that at higher sulphate
7 regimes you might see -- in doing these kinds of tests,
8 you might see things like sulphate, you know, toxicity
9 issues slowing uptake into tissues, for example? You
10 might see maybe sulphates having adverse effects on
11 growth rates that would slow selenium up -- slow
12 selenate uptake rates. Are those sorts of outcomes or
13 possible -- things possible to see as why -- what you
14 may be seeing in the high sulphate regime on a study
15 like this?

16 A Well, I'll -- maybe I'll take a start at that, and then
17 I'll -- I think I'll pass it over to -- to
18 Mr. DeForest, actually, if he has any further comments.

19 Like, the -- particularly for *Pseudokirchneriella*,
20 the -- the first allable species, it also was used in
21 the sulphate trials, and -- and we -- and it's a very,
22 very common species. There's a huge amount of data out
23 there for that, sulphate effects on *Pseudokirchneriella*
24 or -- or duckweed. And, you know, we're -- we're
25 fairly confident that in these -- these lower ranges --
26 like, they're actually -- they're not really lower

1 ranges, but these ranges up into the -- I don't think
2 in our sulphate tests we saw any effects on
3 Pseudokirchneriella, that -- that I would need to go
4 back and confirm against it, but I know in -- it's very
5 common not to see kirchneriella -- or
6 Pseudokirchneriella respond to sulphate.

7 That doesn't really get at your question, though,
8 about whether or not it might change selenium
9 metabolism, and so maybe I'll pass that over to
10 Mr. DeForest.

11 A MR. DEFOREST: Yes. Good morning.

12 Yeah. I don't know too much about the effects of
13 sulphate on algae, I have to admit, so I'm not sure I
14 have too much to add here. I don't know if this is
15 directly related to the question or not, but I think
16 some of the reason we see the levelling off with the
17 increasing sulphate concentration, the levelling off of
18 the relationship with the enrichment function, is that
19 the -- you know, sulphate competes with selenate for
20 uptake, so as those sulphate concentrations get higher
21 and higher, it becomes kind of a limiting step as to
22 how much more mitigating influence you'll see from the
23 sulphate. And just wanted to point that out.

24 I don't know if there's the possibility that you
25 see a reduction in the enrichment function because of
26 some effects of sulphate on the algae themselves, but,

1 again, I don't -- I'm not familiar with any studies
2 that suggest that they're highly sensitive to -- to
3 sulphate, so I can't speak to that directly,
4 unfortunately.

5 Q Okay. And actually, Mr. DeForest, it's great that you
6 jumped in because I want to wrap up this section of
7 questions with a few directed at you, if that's okay.
8 And I want to show something that we saw from you.

9 MR. O'GORMAN: So, could we, please, Zoom
10 Host, see Registry Doc 89. And when you get in there,
11 look at page --

12 Q MR. O'GORMAN: Actually, you know what? We
13 might not need to -- I'll ask you -- I'll put this to
14 you. This might be one that we can avoid going to it.

15 In here, would you say, Mr. DeForest, that -- I
16 think you noted that modelled waterborne selenium and
17 sulphate -- on page 1105 of CIAR 89, did you note that:
18 (as read)

19 Modelled waterborne selenium and sulphate
20 concentrations do not substantially vary
21 annually or seasonally.

22 And that was based on the original SRK modelling done
23 back in the original EIS. I could haul it up, or you
24 can tell me if you agree that that's something you
25 would have --

26 A I agree. That sounds correct.

1 MR. O'GORMAN: Okay. So this is what I
2 actually wanted to bring up, Zoom Host. And I'm almost
3 done, folks.

4 Ms. Court Reporter, we will be taking a break very
5 shortly.

6 Q MR. O'GORMAN: Let's please look at Registry
7 Document 313 and PDF -- which is Addendum 11, PDF 1191
8 and also 1192. Okay, this is the figure we looked at
9 earlier.

10 In Addendum 11 earlier this year, Benga updated
11 modelling results to incorporate hydrology and monthly
12 hydrology and climate change. Now I think we would
13 agree we would see a seasonality effect in here.

14 You'll notice that there's a fluctuating
15 sulphate --

16 Can we scan in a bit, please. Yes. 1191 that
17 we're at. Okay.

18 Sorry, I got a big -- I got a bit off track there.

19 So is this the figure that shows us the
20 fluctuating --

21 1192 is the one that I want, sorry. One more page
22 down. Just -- yeah. The fluctuating sulphate-based
23 selenium guideline. Sorry. My notes got a bit screwed
24 up. I guess it could be one -- sorry, both figures are
25 relevant, okay.

26 Mostly what I want to demonstrate is that in --

1 Mr. DeForest, in the original work that you showed us,
2 you talked about the lack of seasonality, I think you
3 said, was important and vary substantially annually or
4 seasonally. Now we see some more recent results that
5 were submitted to us that does show considerable swings
6 with the different times of the year, and I wonder if
7 that makes you think differently about your risk
8 assessment?

9 A MR. HOUSTON: So, Mr. O'Gorman, if I could
10 jump in before Mr. DeForest does. You know, we were
11 asked to create these graphs showing the seasonality or
12 potential seasonality.

13 I just wanted to point out that there is some
14 flexibility in the treatment system itself. The SBZ,
15 among other things, is a huge reservoir, let's call it,
16 and so the ability to modulate the rate of return of
17 treated water to the environment does exist, especially
18 in the later years. So we can turn up and turn down
19 the -- the flow rate or the pumping rate of the
20 effluent out of the SBZ, and especially in the later
21 years when -- when the volume of the SBZ is -- is so
22 much -- so many times larger than required.

23 Yeah. I just want to make that point. Not to put
24 too much stock in these -- these lines going up and
25 down. It kind of assumes a steady-state flow out of
26 the SBZ, and that's not necessarily the case.

1 Q Will you not have a steady-state flow out of the SBZ?

2 A We don't need to have a steady-state flow out of the
3 SBZ. We can -- we can manage that up and down on a
4 seasonal basis.

5 Q Okay. But to the extent, Mr. Houston -- and,
6 Mr. DeForest, it's really -- it's directed at you, we
7 did just, you know, earlier this year receive some new
8 modelling results from -- from Benga.

9 A Yeah.

10 Q I don't need to haul them back up again, but they did
11 show selenium levels -- potentially concentrations
12 that, at least seasonally, hit the
13 10-microgram-per-litre level. And the study that I
14 referred to earlier did, on your behalf, look at
15 selenium concentrations of about 7 micrograms per
16 litre. If -- I think you agree that's -- that's the
17 number you --

18 A M-hm.

19 Q -- looked at back then.

20 You comment on the validity and reliability of
21 your earlier risk assessment conclusions to a world
22 where we're seeing selenium hitting the
23 10-microgram-per-litre level that these results suggest
24 might be possible?

25 A MR. DEFOREST: I could speak generally. I'd
26 probably have to look back at the model to confirm that

1 what I recollect -- and I believe I conducted this
2 exercise after seeing those more seasonal results --
3 was to understand how that could influence the model.

4 The sulphate concentrations were similarly
5 fluctuating in a pattern similar to the selenium. So I
6 think in terms of the model predictions, did not --
7 they did not change substantially because when the
8 selenium concentrations are predicted to be higher, the
9 sulphate concentrations are, likewise, predicted to be
10 higher so that mitigating effects don't carry as --
11 carries along through -- through the model.

12 MR. O'GORMAN: I'm going to -- I think that
13 is probably a good point for us to break, Mr. Chair,
14 for -- for a lunch break.

15 Thank you, Mr. DeForest, Mr. Houston, and everyone
16 else.

17 We can't hear you, Mr. Chair. No. Your mute is
18 not on, but we're not hearing you. It must be on your
19 end. Is your mic down on the side of your --

20 Would you like me to relay a message to the
21 assembled masses, if you want to type it to me? I
22 don't see anything from you.

23 I'm going to assume you're inviting us to take our
24 lunch break now, and that we would reconvene at 1:00.
25 Nod your head if that's what you want. Oh, 12:45.

26 So our Chair is asking that we take a lunch break

1 and reconvene at 12:45.

2 Any business before we close? Okay. Thank you,
3 all.

4 _____

5 PROCEEDINGS ADJOURNED UNTIL 12:45 PM

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1 Proceedings Taken via Remote Video

2

3 November 21, 2020 Afternoon Session

4

5 A. Bolton The Chair

6 D. O'Gorman Hearing Commissioner

7 H. Matthews Hearing Commissioner

8

9 M. LaCasse AER Counsel

10 B. Kapel Holden AER Counsel

11

12 K. Lambrecht, QC Joint Review Panel Secretariat
13 Counsel

14

15 T. Utting IAAC Staff

16 E. Arruda AER Staff

17 D. Campbell AER Staff

18 T. Turner AER Staff

19 T. Wheaton AER Staff

20 A. Shukalkina AER Staff

21

22 M. Ignasiak For Benga Mining Limited

23 C. Brinker

24

25 R. Warden For Ktunaxa Nation

26 T. Howard

1	K. Poitras	For Métis Nation of Alberta
2		Region 3
3		
4	Chief B. Cote	For Shuswap Indian Band
5		
6	B. Snow	For Stoney Nakoda Nations
7		
8	R. Drummond	For Government of Canada
9	S. McHugh	
10		
11	A. Gulamhusein	For Municipality of Crowsnest
12		Pass
13		
14	M. Niven, QC	For MD of Ranchland No. 66
15	R. Barata	
16	J. Nijjer (Student-at-Law)	
17		
18	B. McGillivray	For Town of Pincher Creek
19		
20	D. Yewchuk	For Canadian Parks and
21		Wilderness Society, Southern
22		Alberta Chapter
23		
24	R. Secord	For Coalition of Alberta
25	I. Okoye	Wilderness Association, Grassy
26		Mountain Group, Berdina Farms

1		Ltd., Donkersgoed Feeder
2		Limited, Sun Cured Alfalfa
3		Cubes Inc., and Vern Emard
4		
5	R. Cooke	For Crowsnest Conservation
6		Society
7		
8	G. Fitch, QC	For Livingstone Landowners
9	C. Agudelo	Group
10		
11	M. Sawyer	For Timberwolf Wilderness
12		Society and Mike Judd
13		
14	(No Counsel)	For Barbara Janusz
15		
16	(No Counsel)	For Jim Rennie
17		
18	S. Elmeligi	For Alberta Chapter of the
19	A. Morehouse	Wildlife Society and the
20	S. Milligan	Canadian Section of the
21	M. Boyce	Wilderness Society
22		
23	J. Gourlay-Vallance	For Eco-Elders for Climate
24		Action
25		
26	L. Peterson	For Trout Unlimited Canada

1 R. Campbell For Coal Association of Canada
2
3 (No Counsel) For Alistair Des Moulins
4
5 (No Counsel) For David McIntyre
6
7 (No Counsel) For Fred Bradley
8
9 (No Counsel) For Gail Des Moulins
10
11 (No Counsel) For Ken Allred
12 (Not Present)
13
14 (No Counsel) For Monica Field
15
16 S. Frank For Oldman Watershed Council
17 A. Hurly
18
19 C. Forster, CSR(A) Official Court Reporter
20 _____
21 (PROCEEDINGS COMMENCED AT 12:51 PM)
22 GARY HOUSTON, DANE MCCOY, MIKE YOUL, MIKE BARTLETT,
23 CORY BETTLES, DAVID DEFOREST, SOREN JENSEN,
24 MARTIN DAVIES, LEIF BURGE, DAN BEWLEY, Previously
25 Affirmed.
26 STEPHEN DAY, NANCY GRAINGER, Previously Sworn

1 THE CHAIR: Okay, Mr. O'Gorman. Whenever
2 you are ready to resume.

3 MR. O'GORMAN: Thank you, Mr. Chair.
4 Alberta Energy Regulator Staff and Panel Questions
5 Benga Mining Limited

6 MR. O'GORMAN: Good afternoon, everyone.
7 Let's, please, Zoom Host, bring up Addendum 10. That's
8 Document 251, Package 5, PDF 50 -- 52.

9 Q MR. O'GORMAN: So I will start to speak to
10 it. This was a question we had asked you, Mr. Houston,
11 about, essentially: How long will you need to continue
12 to treat water for this project? We've heard a number
13 of estimates raised throughout the hearing, and there's
14 no -- I mean, if I could characterize on your behalf,
15 what I think I've heard you say is you don't have a
16 good sense of that. Do you want -- is that an accurate
17 way to describe how I've heard you, you know, talk
18 about how long you're going to have to continue to
19 treat water?

20 A MR. HOUSTON: That's right.

21 Q Okay. So in this document, IR Response 56(c), is
22 that (c)? Right. We were asking you about processing
23 after mine closure, and there's a number in here. If
24 we scan in, please. Oh, it's at the very bottom of the
25 page, where you gave us an estimate of 20 million over
26 25 years as your plans for continuing -- oh, it's at

1 the bottom of that, right, page. Is that --
2 approximately a million a year, is that a -- you know,
3 for 25 years. And at the same time, as you just said
4 through the hearing, you have said you don't have any
5 real, good sense of how long it's going to go on.

6 So my question is: Given active management and
7 treatment of elevated parameters of selenium and other
8 potential contaminants of concern, it looks like it's
9 going to be required for many decades; otherwise, if
10 they're not treated, resulting in large increases in
11 concentrations of selenium and other parameters over
12 time. Can you tell us why, first of all, in
13 Addendum 10, you came up with an answer to an IR that
14 said it would cost you 20 million over 25 years? Or
15 was the 25-year guess based on then?

16 A I -- I guess, Mr. O'Gorman, we don't know as much as we
17 will know today, and so to -- to a certain extent,
18 this -- this number is based on, you know, judgment.

19 I -- I would say that by the time we get to the
20 end of mine life, we will know a lot more in terms the
21 ex-pit back -- rock dumps are behaving. They will have
22 been -- especially in the south, they will have been
23 reclaimed. They will be operating for many years, as
24 will the first phases of the SBZ be -- you know, be
25 operating for many years. And so we'll get a better
26 sense for that, and we'll be able to put a better

1 estimate on that when we get to the end of mine.

2 I would also say that if it looks like a bigger
3 number, there would be some motivation to perhaps look
4 at some additional mitigations that could be employed
5 at that stage of the project to reduce that number,
6 so -- but at this point, it's very much, you know, a --
7 I won't say a guess, but professional judgment.

8 Q Okay. And I will ask you, Mr. Houston: The number we
9 received in this IR response of less than a million a
10 year, it says at the bottom of the page, that did not
11 include things like a potential metals treatment plant,
12 a potential advanced oxidation process, and a range of
13 other of those kind of thing -- contingencies that, you
14 know, are possible from this project?

15 A Yeah. No. It's -- it's not an estimate based on
16 operating specific pieces of equipment. It's -- it's
17 really a -- a broad number.

18 And I would say that if -- you know, if we had a
19 metals treatment plant and a lot of other hardware
20 sitting there, that -- that you'd want to go back and
21 look at the -- the source of the selenium and other
22 things you're treating for and how can you -- how can
23 you shorten that time frame by -- by making some
24 changes to the -- the source of the -- of the issue.

25 Q Okay. And I guess if the -- it's possible that if you
26 needed to do more than currently planned, the costs per

1 year, are they the sort of costs per year that might
2 reach the prohibitively expensive stage for a company
3 that's no longer mining that project?

4 A Again, I -- I think that as we get to this stage of the
5 project and thinking about the Mine Financial Security
6 Program where this number -- or a number very similar
7 to it does show up in our estimate operating for a
8 number of years. So that's part of the estimate that
9 we'll be making and including in our Mine Financial
10 Security Program annual reclamation estimates.

11 So, yes, as that number gets bigger, then -- then
12 a company -- and even while we're operating, would --
13 would be, you know, motivated to look at what other
14 measures could be put in place to accelerate that
15 reduction of effort.

16 MR. O'GORMAN: Okay. And can we look at one
17 last related point, please, Zoom Master. Can we call
18 up Addendum 8? That's Registry Document 89, PDF 181.
19 And I'm not sure if it will be near the top or the
20 bottom of the page. Let's see when we get there.
21 PDF 181, Registry 89. Right, 181. Great. Where is --
22 there it is. It's the very first thing that we see.

23 Q MR. O'GORMAN: Mr. Houston, you told us in
24 this package that active management of the surge ponds
25 are expected to be required beyond Year 2100, but it's
26 not possible to reliably estimate the time horizon for

1 when the rate of weathering and selenium release will
2 diminish to a point where you no longer need to
3 actively manage.

4 Is that something you agree with?

5 A I'm looking for the word "2100" here.

6 Q It's at the very -- your first response at the top of
7 the page, the first sentence of your -- in your
8 response.

9 A Yeah.

10 Q Okay.

11 A So our -- our modelling -- our modelling -- and that's
12 shown in all the graphs -- doesn't show attenuation
13 over time simply because, you know, we haven't got a
14 good handle on how to build that into the model. So
15 the models do project out beyond 2100.

16 And so it's the second sentence there that I think
17 we'd -- we'd be more comfortable with: (as read)

18 It's not possible to reliably estimate the
19 time horizon when the rate of weathering and
20 selenium release will diminish.

21 So that would be the -- the sentence to hang your hat
22 on.

23 Q Okay. I won't haul up these results to illustrate,
24 but, I mean, I guess I'd ask you if you agree that,
25 yes, you said your models go to 2100. But those models
26 produced results that showed elevated levels of

1 selenium and other constituents of concern to 2100 as
2 well, at least in your early EIS documents and the ones
3 we just looked at a few minutes ago. So do you support
4 those model results that there's no reason to assume
5 things just, you know, attenuate on their own after
6 2100 or --

7 A No. The -- the issue is that with -- without a
8 mathematical relationship, we can't build that
9 attenuation in the models. We do -- we do know, and we
10 see from other examples of other mines, that -- that
11 attenuation or reduction of the selenium loading does
12 occur. It will -- it will -- it will happen. We have
13 confidence it will happen. It's just without having a
14 mathematical relationship we can hang our hat on, we --
15 we couldn't build that in the models. So the -- the
16 models artificially show this perpetual horizon.

17 We -- we believe that there is tendency downwards.
18 It's just we can't build that into the modelling.

19 Q Can I ask to throw one direct question at Mr. Day,
20 please? I wonder if you can tell us: In your
21 professional experience, do you have experience with
22 mines that leach metals for a very long period of time,
23 decades and longer?

24 A MR. DAY: Yes. Yes, Mr. O'Gorman.
25 There are -- there are examples of European mines that
26 have -- where there's a long history of mining where it

1 does go on for long periods, but -- but I'm not --

2 Q Hundreds of --

3 A Sorry. Go ahead.

4 Q Hundreds of years in some cases, even?

5 A In some cases, but I very much caution against
6 comparing those often very high sulphide, highly
7 metallic mines to -- to this project.

8 Q And I'm not trying to draw direct comparisons beyond --
9 to that. You know, as a professional in this field,
10 that sometimes -- you'd agree with me, sorry, that
11 metal leaching -- and we're not talking specifically
12 about selenium -- can occur for a long time after mine
13 closure. You agree with that?

14 A I can agree with that, yes.

15 Q Okay. Thank you.

16 Okay. That's good for that group. Thank you,
17 gentlemen. Where was I? Oh, this one.

18 MR. O'GORMAN: Well, we can, take this down,
19 Zoom Host.

20 Q MR. O'GORMAN: Okay. Well, Mr. Houston, you
21 just raised the Mine Financial Security Program. So I
22 wanted to have one or two quick questions for you about
23 that, actually. So if we haul -- actually, I don't
24 think I need to haul this up. I put it to you that you
25 said to us in Addendum 8, Registry 251, Package 5. It
26 was --

1 MR. O'GORMAN: Don't haul this up, Zoom Host.

2 Q MR. O'GORMAN: But it was on PDF 172, in an
3 information request response. It says in there, and
4 I'll ask if you agree: (as read)

5 For the purpose of this exercise, Benga has
6 prepared a hypothetical cost estimate to
7 reclaim the mine site and associated
8 facilities consistent with the intent of the
9 Mine Financial Security Program, MFSP. These
10 calculations are similar to other mining
11 projects that are participating in the MFSP.

12 Does that sound right? You agree with that? You said
13 that?

14 A MR. HOUSTON: Yes.

15 Q Great. Thanks.

16 Can you explain the methodology used to determine
17 the contingency associated with the cost to reclaim the
18 mine site and the associated facilities?

19 A So the specific line in the estimate that is labelled
20 "contingency", is --

21 Q M-hm?

22 A -- is that -- I think it's just a straight percentage
23 that's applied across the -- the estimate.

24 And so we -- we should be clear that this -- this
25 is a pro forma estimate, if you will, and -- and that
26 the -- as we go through, year by year, we'll be making

1 estimates that are based on actual progress and more
2 sophisticated estimates of what -- the cost to reclaim
3 the actual work that has been done. So those estimates
4 will be done year over year and submitted to the AER as
5 part of this program.

6 Q Okay. So it was a pro forma calculation, but you -- so
7 I guess you're saying the sorts of things that you
8 might need to add on for long-term treatment for a
9 period of time to be determined weren't factored into
10 your initial estimates and contingencies of what might
11 be required and -- to comply with that program; is that
12 right?

13 A I believe that we did have a line in there for -- let
14 me just -- I'm just paging down here. So we have a
15 line -- are we looking at PDF 5.33-8 on PDF page 180?

16 Q I didn't even haul it up on my own. We can, if you'd
17 like.

18 A Well, we've got a care and custody line in there for
19 \$22 million, and that's that long-term annual cost that
20 we were talking about.

21 Q Right. 22 million. Not per year, is it? Or is that
22 what you -- I'm not looking at the number.

23 A No. That's the outstanding liability at -- at that
24 point in time.

25 Q Okay. Okay. All right. Thank you.

26 Okay. Let's talk about the Oldman reservoir,

1 which is something that we've heard -- oops, okay --
2 we've heard some interest expressed earlier and through
3 some -- some submissions and we asked you some
4 questions about.

5 MR. O'GORMAN: We'd like to start by looking
6 at page -- sorry, Addendum 11, Registry Document 313,
7 and PDF 267, Zoom Host, please. One second here.

8 And the text I'd like you to look at -- do you see
9 in here -- I need to find where it is on the page
10 myself. One second. Right. I think it's the second
11 paragraph that we -- if we're looking at the same
12 thing, we would see -- if you scan in a bit on the top
13 of that page, please, Zoom Host.

14 Q MR. O'GORMAN: Right. So the paragraph --
15 the first full paragraph we see says that results of
16 the wildlife risk assessment indicate you applied a
17 conservative application -- oops. My computer is
18 trying to shut me down. I'm sorry. And I need to do
19 something. My apologies, folks. I have this ongoing
20 issue with Citrix trying to kick me out of my system.

21 Now, I'll allow you to read that paragraph. And
22 it essentially suggested -- technology.

23 Okay. Essentially suggested that you use the 95th
24 selenium concentration into -- as being .41 milligrams
25 per litre. You see that?

26 A Micrograms per litre, Mr. O'Gorman.

1 Q Yes, micrograms per litre. Yes. I apologize. I got
2 distracted.

3 Okay. So we see you used that value there.

4 Now I'd like to look at, instead, in -- go back a
5 couple of pages to PDF 265. So, first of all, that
6 value, what was that? Was that the incoming selenium
7 concentration into the reservoir? Can you tell me what
8 that value was?

9 A Just one minute. I'll -- I'll have to check. That --
10 that is in the reservoir, Mr. O'Gorman.

11 Q That would be the value in the reservoir. Okay.

12 A Yes.

13 Q So I think it says that you derive that from the water
14 and load balance model results. We think, at least.
15 Page 265 and down at the bottom. Please scan then to
16 see what it says there. No. 265. 265. Okay. 265.
17 There we go. And at the bottom of the page, not the
18 table.

19 So the project's water and load balance model was
20 used to estimate monthly loadings to Blairmore Creek
21 and Gold Creek. The load estimates were derived from
22 the scenarios submitted back in your original EIS, and
23 then estimates of concentrations in the
24 Crowsnest River -- you can read the text there. So
25 that's all correct in terms of the work that you did;
26 right?

1 A Yes.

2 Q Okay. Now I want to look at the same document. Let's
3 go back to 267. Oh, actually, I don't think I need --
4 so the predicted concentration, we already established,
5 was .41 micrograms per litre in the reservoir from the
6 analysis that you did.

7 Now I want to go look at what's referred to. It
8 says here that you used these results to inform this.
9 We're going to look at your original EIS, Registry 42,
10 Appendix 10B, please. Going to need PDF 261 and -- no,
11 not that one. That one is opposed to your project,
12 according to that comment that was just displayed.

13 MR. O'GORMAN: So we're back in CIAR 42,
14 Appendix 10B, Zoom Host. And now -- no, no, no, no.
15 It's the original EIS, so Registry Document 42, and in
16 that Appendix 10B. Okay. And in this, we're going to
17 go to page 261, please. Okay. Down at the bottom of
18 the page.

19 Q MR. O'GORMAN: So these were the original
20 selenium results that you apparently used, according to
21 what we just read, that shows selenium increasing to a
22 plateau of about slightly less than 7 micrograms per
23 litre after about ten years and then carrying on for
24 some time. Everyone agrees with that?

25 A Yes.

26 Q Okay. And then when we got updated modelling results

1 in Addendum 11 -- so let's go to Registry 313.

2 MR. O'GORMAN: It's the tab immediately next
3 to it above, Zoom Host, Registry Document 313, yeah.
4 And we're going to look at page 1191, please, which we
5 may have seen before. 1191, yeah.

6 Q MR. O'GORMAN: And here we see mean monthly
7 selenium concentrations increased to a plateau of
8 between 4 and 11 micrograms per litre year 25
9 through 80, which is the final modelled year.

10 You agree with all that too, that this is what
11 this is telling us?

12 A Yes.

13 Q Okay. So now we'd like you to help us understand.
14 Could you clarify whether it was the mean or the 95th
15 percentile model results that were used as an input to
16 calculate selenium loadings into the Oldman reservoir?
17 And which model results did you use? Did you use the
18 ones that were shown in the original EIS back in
19 Document 42 or these ones we're looking at right now?

20 A MR. JENSEN: I'm good to -- can I answer
21 that? Okay.

22 Yeah. So, Mr. O'Gorman, it's -- for those
23 calculations, what we looked at were the -- were the
24 loadings that were -- that originated from the proposed
25 project area and -- and would then report to Blairmore,
26 and to Gold, to a lesser extent, and then end up in the

1 Crowsnest and then flow down to the Oldman River.

2 So what you see here, in fact, is, in spite of
3 these graphs, the concentration calculations would be
4 quite different, and that -- you know, that all goes
5 back to my previous comment on -- on the level of
6 conservatism shown here. The loadings in the two model
7 scenarios are, in fact, the same.

8 So when we updated these -- at least as far as
9 selenium goes, because, as you recall from our earlier
10 discussion, the selenium loadings are based on mass
11 considerations, so it's based on the presumption of a
12 steady-state oxidation rate of sulphite minerals that
13 then release sulphate and selenium.

14 So in as far as the sources go, having changed
15 between these two model runs, it still -- it's still --
16 is true for both model runs that we have a -- have an
17 ever-increasing volume or mass of waste rock that then
18 delivers a, you know, corresponding volume or mass --
19 well, mass of -- of sulphate and selenium. So the only
20 thing that changes between these scenarios is our
21 assumptions around the timing of release into the
22 environment and the -- the background hydrology. The
23 loadings are the same. They're identical. So --

24 Q Okay.

25 A And even the release of the loadings are identical. So
26 it -- anyways, that's -- and also, I mean, when you do

1 do a comparison, I think the most constructive one to
2 look at is probably BC01, which is the southernmost
3 point. So that's where all project effects have been
4 realized. So I think in this scenario here -- anyways,
5 yeah. I won't --

6 Q I don't know if -- Mr. Jensen, I don't know if I heard
7 you say you used mean loadings or the 95th percentile
8 of the loadings.

9 A I believe we did use the 95th percentile of loadings,
10 but with the -- I'd say with the footnote that when we
11 do the -- there's very little difference in the model
12 between the mean and the 95th percentile because it is
13 all governed by -- by the mass of waste rock. So it
14 really is just a difference in loadings that we might
15 see from, say, natural background or -- which is very,
16 very small. So it -- but it was the 95th percentile,
17 strictly speaking.

18 Q Okay. Can we please look at -- we're in 3 -- yeah.
19 Can we look at 313, which we're in, and PDF 1310. So
20 this is a nice table. We're going to need to blow it
21 up. And you guys might want to haul it up on your own
22 screens there. These were some results that you gave
23 us in March of this year. 11th row from the bottom
24 should be selenium, if you see "selenium" there. I
25 think you -- now we're going to scan over until we see
26 the Blairmore Creek selenium concentration that was

1 used.

2 MR. O'GORMAN: And now we're going to --
3 that's right, Zoom Host. You've got it.

4 Q MR. O'GORMAN: We're looking for -- if you
5 keep your eyes on where the Blairmore Creek -- the
6 "selenium" line was, and we scan over to Blairmore
7 Creek, the application value, I'll ask you to
8 confirm --

9 MR. O'GORMAN: Can we blow it up one more,
10 please, Zoom Host. I've got my eye on the value now,
11 although now, of course, we'll lose it when we blow it
12 up.

13 Q MR. O'GORMAN: But it is the 4.82 times 10 to
14 the minus 3, would be the value used, according to this
15 table. You see that number there, and you agree that
16 that lines up with selenium, which is now off the
17 screen?

18 A MR. JENSEN: Yes, we agree.

19 Q Okay. So we just want to confirm: This is used -- can
20 you confirm that this is used for calculating the
21 concentration entering the reservoir?

22 A MR. HOUSTON: Just one second. So,
23 Mr. O'Gorman, just give us a few minutes just to
24 formulate an answer.

25 Q Okay.

26 A MR. JENSEN: Mr. O'Gorman, I apologize for

1 the delay here. We are clarifying because this --
2 these numbers were handed up between various parties
3 that were involved in these calculations.

4 So, yeah, I mean, this number appears to be
5 consistent with the concentration we first -- you first
6 took us to in Appendix 10B, where we showed that the
7 concentrations of BC01, the downstream-most point in --
8 in Blairmore Creek, were slightly less than 5, as you
9 pointed out.

10 And as -- as I testified to in my previous
11 response, is -- well, yeah, that's the concentration
12 measurement. What we're really interested in, when it
13 comes to estimating effects on something like a
14 reservoir, are the loadings. So we could have put a
15 different number in here. It wouldn't -- you know,
16 that, perhaps, would have been reflective of maybe,
17 perhaps, the maximum concentrations that we've reported
18 elsewhere. But it -- the loadings would have been
19 identical. The model -- there's no changes to loadings
20 in the model. So it's -- it's a little bit of apples
21 and oranges we're looking at here.

22 Q Well, I guess, Mr. Jensen, this is the table you gave
23 us to inform this assessment that we -- that you did
24 when we asked you about the potential for risks in
25 the -- in the reservoir, and the -- you know, you read
26 the line a minute ago that said you used 95 --

1 95th percentile.

2 A M-hm.

3 Q Are you saying that that value, if it's -- you know,
4 it's -- it's about 5 in the graph, and the graph we
5 looked at earlier, that the mean is basically about the
6 same as the 95th percentile? I'm not sure. Just -- we
7 couldn't understand the calculation basis to -- and is
8 this -- here's the question: Did you use a
9 conservative value to calculate what the projected
10 concentration will be in the reservoir?

11 A Yeah. Can I -- yeah. So, yes, I mean, we did. It's
12 worth noting, though, when you -- we have to be precise
13 about what we're talking about here, because I'll just
14 restate: When we look at potential effects to a
15 reservoir like the Oldman reservoir -- I won't say it
16 again, I promise, but it -- we're looking at loadings.
17 So what concentrations -- whatever they happen to be at
18 any given point in time will tell us -- when we
19 multiply that by flow, will tell us what the loadings
20 are at that given point in time.

21 But when you say the 95th percentile in -- my
22 interpretation of -- because that's what matters here.
23 My interpretation of what we need to look at is: What
24 are the 95th percentiles of -- of the cumulative
25 loadings over that time? And so that's precisely what
26 we looked at.

1 To -- to look at the 95th percentile of
2 concentrations at any one given point in time would --
3 wouldn't give us any meaningful result at all. Like,
4 it -- so -- so I'm not disputing that -- that we issued
5 this table, but what I am saying, what we perhaps
6 should have done is -- is to put the loading in there
7 that -- that we estimated and clarified that that's the
8 95th percentile. I think that might have been list --

9 Q I mean --

10 A (INDISCERNIBLE - OVERLAPPING SPEAKERS)

11 Q Yeah. Mr. Jensen, we asked an information request for
12 you to think about what the potential impact on the
13 Oldman reservoir would be. You gave us this
14 information --

15 A Correct.

16 Q -- that we are, I will admit, having a hard time
17 figuring out what you gave us.

18 A So --

19 Q You should have given us loadings, maybe.

20 A Sorry.

21 Q Maybe you should have given us loadings.

22 A MR. HOUSTON: Can we just take a minute to
23 confer again, Mr. O'Gorman, just --

24 Q By all means, please.

25 A So, Mr. O'Gorman, we're just trying to find a better
26 way to explain this. So this number, the 4.82 times

1 10 to the minus 3, that -- that is from the original
2 filings. And as Mr. Jensen mentioned, the loadings
3 that inform that number are -- haven't changed. What
4 has changed in the -- in the more recent information is
5 that we were asked to project the loadings on a -- I
6 think it was a monthly time step. So you get that --
7 the line that is -- well, it's more spurious, let me
8 say.

9 What's important here is the loading. And if you
10 take the loading -- or the 4.82 and multiply it by
11 the -- the amount of flow from Blairmore Creek
12 associated with that calculation, then -- then you get
13 how much selenium that -- the actual loading of
14 selenium. And -- and so that's what's been done here
15 with these numbers. The loading's the same, and the
16 concentration -- perhaps we shouldn't have put
17 concentrations in here. Perhaps we should have put
18 loadings. But we -- the concentration needs to be
19 related to the flow rate and the appropriate time scale
20 for that flow rate. So if it was an annual average
21 flow rate that led to the 4.82 times 10 to the minus 3
22 concentration, then you have to multiply 4.82 times 10
23 to the minus 3 times the annual average flow rate to
24 get the loading. I don't know if that's a clearer
25 explanation.

26 Q That's fine for now. Thank you, Mr. Houston and

1 Mr. Jensen.

2 So I will go to my next set of questions about
3 this issue. So can you tell us -- and I'm not sure who
4 would be the right person, but I would appreciate it
5 from one of the experts, please, Mr. Houston. Can you
6 give us your estimate of what selenium concentration in
7 the Oldman reservoir would be the threshold above which
8 you would have concern with respect to the accumulation
9 of selenium in fish muscle or egg or ovary tissue?

10 A MR. DEFOREST: Mr. O'Gorman, I think I can
11 help answer that question.

12 Q Okay. Thank you.

13 A This is David.

14 Well, I mean, we can start with existing selenium
15 kind of line values, I think, as a starting point for
16 answering that question. We talked about the -- the
17 BC, as adopted by Alberta, guideline of 2 micrograms
18 per litre. That's intended to be protective of highly
19 bioaccumulative sites, which includes lentic water
20 bodies, such as a reservoir. And so even just to look
21 at other values, I think we also talked about, sometime
22 during this process, of the 1 microgram per litre being
23 used as an alert concentration, which I would consider
24 to be a -- quite a conservative value for the -- for
25 water and dense protection of the accumulation of
26 selenium and fish tissue levels into fish tissue that

1 could be at levels of -- could be of concern for
2 toxicity.

3 And just to put another data point out there for a
4 comparison, just -- I refer to the US Environmental
5 Protection Agency has developed water base selenium
6 criteria of 1.5 micrograms per litre for lentic waters
7 and 3.1 for lotic waters, but -- so USEPA had a lentic
8 criterion of 1.5 micrograms per litre.

9 In my opinion, I think those are protective values
10 for lentic water bodies. If I -- I'm referring to the
11 EPA number of 1.5 just as one point of comparison, just
12 given the nature of how they did the calculation of
13 that criterion value, which was based on compiling data
14 from a relatively large dataset of field data from
15 lentic water bodies with varying selenium exposure
16 conditions and which -- some of those sites included
17 reservoirs. And so based on that evaluation, that --
18 went into how they developed that lentic criterion of
19 1.5 micrograms per litre.

20 So just -- I guess to summarize, I think -- you
21 know, I think the waterborne selenium criterion --
22 criteria or guidelines for -- in the order of 1.2 to
23 2 micrograms per litre are -- are conservative
24 protective values.

25 Q In that type of environment, lentic environment?

26 A It's, yes, in a lentic environment.

1 Q Could you envision, Mr. DeForest, circumstances where
2 there might need to be lower guidelines than that range
3 you spoke about to be protective? In particular, I
4 guess I'm wondering if you think there are, you know,
5 mechanisms that play in reservoirs that might trigger
6 the need for more conservatism?

7 A Well, there clearly are conditions in -- in reservoirs
8 and lentic water bodies, in general, where you can have
9 increased selenium cycling, the higher producing
10 conditions (INDISCERNIBLE).

11 THE COURT REPORTER: I'm sorry. I'm having a hard
12 time hearing you.

13 A MR. DEFOREST: Yeah. I apologize.

14 Let's see. Where I was at, I think, was there are
15 conditions in reservoirs and lentic water bodies, in
16 general, due to the longer selenium residence time
17 and -- and cycling within those systems in the
18 potentially increased reducing conditions, biological
19 productivity. And in some cases, that can all
20 contribute to higher selenium bioaccumulation
21 potential.

22 It can be trickier in some reservoirs with -- with
23 drawdown and how that contributes to biological
24 productivity in selenium cycling, but whether that
25 supports a more conservative value, I don't necessarily
26 think so. I -- I tend to think of the -- the most sort

1 of high-risk systems being more stable, productive
2 wetland-type environments that -- where maybe more
3 conservatism would sometimes be warranted.

4 So I guess for Oldman reservoir, I'm not familiar
5 with any -- any aspects of that reservoir that, I
6 guess, would make me rethink whether a criterion or
7 guideline on the order of 1.5 to 2 micrograms per litre
8 would not be protected.

9 Q Okay. Thank you, Mr. DeForest.

10 MR. O'GORMAN: I'm going to call up
11 something, please, Zoom Host. So 313. So we can --
12 okay. We're in 313. Let's go page PDF 269, please.
13 Maybe let's look at the full page here.

14 Q MR. O'GORMAN: So there's a statement similar
15 on this page. I don't remember if I saw this at the
16 top or the bottom or the middle of the page. But maybe
17 while we're looking for it, there is an assertion that
18 we would expect selenium concentrations in the Oldman
19 reservoir to diminish with time, and I guess I'm
20 curious when -- we won't go back to look at the
21 modelling results we've seen several times, but they
22 did not show selenium concentrations coming from your
23 project into the Blairmore River over a long period of
24 time. And those were not shown to decrease; they
25 stayed at a plateau.

26 So what's the basis for the statement in here?

1 Unfortunately -- someone help me out here. Is that --
2 where in this page -- but I'll -- you make the
3 assertion that you'd expect to see them diminish over
4 time? And I guess I'm curious where that comes from.

5 It's at the very bottom of the page -- I just got
6 a note -- if we need to direct your eyes.

7 MR. AGUDELO: Mr. O'Gorman --

8 MR. O'GORMAN: 269, yes.

9 MR. AGUDELO: It's in the last bullet point
10 of that page.

11 MR. O'GORMAN: Great.

12 THE COURT REPORTER: I am sorry; who was speaking
13 there?

14 MR. AGUDELO: This is Cesar from the
15 Livingstone -- or, sorry, Mr. Agudelo from the
16 Livingstone Landowners Group.

17 A MR. HOUSTON: So, Mr. O'Gorman, I would
18 suspect that's the same -- same discussion we had just
19 a little while ago that although we have not built any
20 degradation or diminishing aspect of the selenium
21 loading in our modelling -- and that discussion you
22 remember well. So I think this is the same -- same
23 kind of statement that we -- we would expect that, as
24 time goes on, the -- the loading in Blairmore Creek
25 and -- and, therefore, the loading downstream would
26 reduce naturally.

1 Q MR. O'GORMAN: Okay. I mean, as a general
2 point, Mr. Houston -- and we had quite a few of these
3 results, and we're going to talk about some of them a
4 bit more as well.

5 But you had quite a few different modelling
6 results for different parameters of concern that we
7 asked you to consider. We certainly -- an element of
8 what we need to consider for this project are not just
9 what happens through the -- through the operation of
10 the mine but in the period once the mine is closed.

11 So, I mean, as a general point, I'm not hearing
12 you express a lot of confidence in the results that you
13 developed and gave us to help us think about a whole
14 range of different modelling projections into what's
15 going to happen in the future, because we -- we can't
16 make these up ourselves. You gave us results for --
17 and I'm, you know, not even pointing out specific ones,
18 but long-term selenium, for example.

19 So help me understand if you have a lot of
20 confidence in the results that we have for your -- the
21 long-term modelling that we need to evaluate and think
22 about. What happens when your mine is closed?

23 A So we have modelled, on a conservative basis, showing
24 no attenuation over time. We have seen at other
25 locations that there is attenuation. Logic tells me
26 that there will be attenuation. I'm just -- it -- it's

1 not possible for us to put a time frame on that or to,
2 you know, define it mathematically and model it. And
3 certainly I agree with you to -- to defend, you know,
4 that it would be one time frame over another.

5 So what we've committed to is -- is to maintain
6 the site, the selenium-treatment equipment, and -- and
7 water management until it's self-sustaining. And so
8 that -- that may be a longer time or a shorter time.
9 That's our commitment here, Mr. O'Gorman.

10 MR. O'GORMAN: Okay. Can we scroll to the
11 top of the next page, Zoom Host, and go to the
12 continuation of that bullet. You did it by accident
13 earlier but -- 270, right. Is that ...

14 Q MR. O'GORMAN: That bullet that does talk
15 about your expectations for the long-term decline of
16 loadings or concentration in the reservoir makes
17 reference to historic mines, and I think you were
18 asserting, if I understand this, that historic mines
19 gave you evidence of -- can you explain what you are
20 trying to tell us on this? You know, it scans over
21 two -- it spans over two pages, unfortunately, but what
22 does -- what is the historic mining evidence telling
23 us?

24 A MR. HOUSTON: Thank you for raising that.

25 No. The fact is that this site has had mining go
26 on. And that was back in the '60s, as we've discussed.

1 And there -- there is waste rock as a result of
2 those -- those activities, and -- and yet the -- the
3 selenium that we see in -- in the water from the site
4 is -- is not as high as you would have expected to --
5 to see from those mine waste sites.

6 We don't know what it was back then. We don't --
7 you know, we can't say that it's gone from 'X' to 'Y',
8 but it does seem that that site has, over time, found
9 its way to a -- you know, selenium loadings that are --
10 that are less than what we are projecting for the new
11 mining activity.

12 Q And --

13 A It's qualitative, Mr. O'Gorman. I understand that.
14 Absolutely, it's qualitative, yeah, information.

15 Q No, I get that. I appreciate you have to do -- you do
16 have to try and come up with information, and I hope
17 you appreciate that it's our job to think about it and
18 try and understand it and get you to explain it to us
19 because if -- if you draw the reference to the historic
20 mining, I mean, I think could -- could I assert, and
21 you'd agree, most of the historic mining there was
22 underground and there were a few years of -- I think it
23 was just a few years -- I'm working from memory -- of
24 surface mining that was a pretty small fraction of the
25 footprint of what your project would be. So would it
26 be possible -- so, first of all, do you agree with

1 those two things that I just asserted?

2 A No. And, absolutely, we're going to be.

3 Q Okay.

4 A Disturbing a much larger site than -- than what was
5 disturbed, yes.

6 Q Okay. For the record, I think when you said "no", you
7 weren't disagreeing with what I said, were you?

8 A No, no. I was agreeing with you.

9 Q Okay. Okay. And we don't have the data from what
10 selenium used to be. So this whole idea of
11 reversibility -- and we're thinking about what happens
12 to the Oldman reservoir over time -- there's not
13 good -- it's qualitative rather than quantitative
14 demonstration of that concept that you are offering us;
15 is that right?

16 A That -- that's correct.

17 Q Okay. Will you commit to monitoring selenium or
18 funding monitoring by others in the Oldman reservoir?

19 A Yes, we would agree to that. I -- I'm thinking of a
20 seasonal monitoring, Mr. O'Gorman, as opposed to a
21 daily monitoring.

22 Q Monitoring a general -- it's just, you know, how --
23 however your response or details, I agree, could be
24 worked out.

25 How about collecting starting-point baseline
26 selenium data prior to construction --

1 A Yes, we could --

2 Q -- as a part of that monitoring?

3 A We could do that, yes.

4 Q Okay. Thank you for that, Mr. Houston and others.

5 Those are my questions on the Oldman reservoir.

6 I've actually gone, this afternoon, faster than

7 I -- I thought I would at -- okay.

8 Yeah, let's ask this: I just have a couple of

9 questions for you about the end-pit lake.

10 We heard big picture, over the course of this
11 hearing, compared to the different iterations of things
12 we have on the record over time. I think you would
13 agree we have seen some of your proposals for what
14 happens -- what does the end-pit lake look like, where
15 does it flow, all of those sorts of questions have been
16 a -- is it fair to describe them as a bit of a moving
17 target over the iterations of submissions and
18 questioning we've received and questions we've asked,
19 and including into today's -- this week's hearing?

20 A I don't think it's a moving target so much,
21 Mr. O'Gorman, as we had proposed in our original
22 submission an option to have an outfall into Gold
23 Creek. That was set aside after we had more work done
24 on the instream flow needs, which -- which was filed in
25 2017. I don't think we, at any point, connected those
26 two. I don't think at any point we said, Oh, we don't

1 think we need that option anymore. And -- and so
2 that's come out more clearly in -- in these
3 proceedings, but -- so I don't know it's a moving
4 target or just we're all -- we're all getting onto the
5 same page.

6 Q Okay. I didn't mean to say "moving target" in a
7 pejorative sense. I -- if you interpreted it that way.

8 I do feel like pointing out, though, that as
9 recently as just over a year ago -- I'm going to put
10 this to you, and hopefully we don't have to haul it up.
11 But in August 2019, in Registry Document 251, which I
12 recall being Addendum 10, we asked you questions about
13 the end-pit lake, and at that time, considerably
14 longer -- later than what you just told me, when you
15 decided to not proceed with this as an option, you gave
16 us an answer in there, and it was on page -- where --
17 what page was it on? We did ask you about the end-pit
18 lake, and we had an answer that it would drain into
19 Gold Creek back in August of 2019.

20 And I guess I wanted to -- can you tell us why at
21 that -- so, you know, coming into preparing for this
22 hearing, we actually thought we might be asking you to
23 explain a bit more clearly the discrepancy between that
24 answer and then in Addendum 11, when you told us you
25 weren't doing that?

26 A I -- so I would call that a quality control issue on

1 our side that we -- that we shouldn't have said that in
2 2019.

3 Q Okay. Okay. Fair enough. Those things can happen.

4 And so to confirm -- however -- right. There was
5 something -- the reason why I even raised this, to
6 confirm what's been discussed this week, I'd like
7 you -- will the final design of the end-pit lake
8 include horizontal drains to Gold Creek? And I'll tell
9 you why I'm asking even before you answer, is because
10 it seemed to us, listening to some of your earlier
11 testimony -- and I don't have the reference to the
12 transcript, but it seemed like you held onto this as a
13 potential option. So I'm asking: Are you holding onto
14 the option that the end-pit lake drains to Gold Creek,
15 or is it not going to drain to Gold Creek?

16 A Our current proposal does not include it draining to
17 Gold Creek, Mr. O'Gorman.

18 I think I -- I recall the discussion that we had,
19 and -- and it was one of those hypothetical questions:
20 What if? What if? What could you do? And at that
21 point, I did say that, well, we could reinstate that
22 kind of idea if -- you know, as one of the potential
23 solutions, but it's not our current proposal to drain
24 to Gold Creek.

25 Q Okay. So it is alive as an option for the future?

26 A I would expect we'd have to have a long discussion with

1 the Regulator before we implemented that.

2 Q Okay. Can you confirm whether or not the plans are
3 that the end-pit lake, if it has -- if that seepage
4 from the end-pit lake would flow towards Gold Creek?

5 A One minute. You're thinking about seepage from the
6 base of the pit lake, not -- not the decanting that we
7 talked about --

8 Q Correct.

9 A -- the other day?

10 Q Correct.

11 A Yeah. One minute.

12 Q Correct.

13 A I'm sorry. Sorry for the delay, Mr. O'Gorman.

14 Yes, we've modelled some seepage out of the
15 end-pit lake into Gold Creek.

16 Q What sort of -- what's the anticipated travel
17 time/residency time? How long does it take the water
18 to get there, underneath that bed of rock?

19 A I think we have the fast answer and the precise answer.
20 Let me -- let me get you the precise answer.

21 Q Fair enough. Although, at this point in the day, maybe
22 the fast answer would be better. Sorry.

23 A Let's say in the order of a year -- many months to a
24 year. Yes.

25 Q Great. Thank you, Mr. Houston.

26 MR. O'GORMAN: Zoom Host, can we please take

1 a look at Document 313, Addendum 11? It's a response
2 to one of our -- our IRs, PDF 1219. That's it.

3 Q MR. O'GORMAN: So here we see, Mr. Houston,
4 some model results you gave us. Year 0 is start of
5 construction. We're looking at selenium concentrations
6 in Gold Creek at different nodes. At the highest node,
7 which is GC02, starting in about Year 20, your
8 modelling produces a dramatic uptick -- not dramatic,
9 sorry, I shouldn't use an adjective like that. But we
10 start suddenly seeing some readings at GC02 of selenium
11 levels in Gold Creek that increase out through time.
12 We've just talked about sort of your long-term
13 modelling. This is starting, you know, relatively long
14 into the life of your project but then carrying on for
15 some time. I wonder if you could just -- and I will
16 also point out that, you know, if you look at the peak
17 of that curve, it gets up to pretty much today's
18 current allowable levels for selenium, right, of 2 --
19 2 micrograms per litre; is that all -- you agree with
20 all that, my reading of that graph?

21 A MR. HOUSTON: Yes.

22 Q Okay. Can you confirm that those results are
23 representing -- or at least including the effect of
24 uncaptured seepage from the end-pit lake through
25 groundwater pathways but -- well, (a), that much?

26 A Yes, I can.

1 Q Okay. And is that the main driver of why you'd see
2 selenium in Gold Creek?

3 Sorry, I'm going to correct that question: Is
4 seepage, not just from the end-pit lake but potentially
5 also from the central rock disposal area, the main
6 drivers for why you would eventually see an increase in
7 selenium in Gold Creek?

8 A MR. JENSEN: Yes. So, Mr. O'Gorman, it is.
9 I can -- I can confirm that it does include seepage
10 from the end-pit lake, but what you see there, the
11 dramatic influx in concentrations corresponds to the
12 time that we estimate that waste rock would be wedded
13 up to field capacity. So at that point, we start to
14 see seepage reporting from the waste rock mass itself
15 and that report to the -- you know, start to migrate
16 down towards the -- specifically for the central rock
17 dump towards the southeast surge pond.

18 And so what you see there is the effect of that
19 relatively small seepage bypass that we -- that we
20 modelled bypassing that. So the seepage takes a route
21 from the waste rock, down towards the southeast surge
22 pond, and then the bypass you see at that location;
23 that's what's -- end up reporting to -- to GC01 -- 02
24 and GC01. And so that -- it's the effect of that
25 bypass that's -- that predominates here.

26 Q Sure. And, of course, that seepage from the central

1 RDA, which is the one that -- and, actually, we might
2 even look at a figure of this later but -- as a bit of
3 foreshadowing, you expect that the CRDA drains towards
4 Gold Creek. That is also, in your contact water
5 capture modelling, the one that you set at an estimated
6 98 percent efficiency of capturing contact water
7 flowing from there and not making it into Gold Creek;
8 is that right?

9 A Yeah, that's right. Well, we are saying that that's
10 the performance that's required between attenuation and
11 seepage capture. Yes, that's correct.

12 MR. O'GORMAN: Okay. Okay. That's -- that's
13 good for this graph, Zoom Host.

14 Q MR. O'GORMAN: I'm going to ask if I can ask
15 you to agree with the -- my assertion that in the early
16 modelling results from the original EIS back in
17 Document 42 for long-term selenium concentrations in
18 Gold and Blairmore Creeks that that we saw -- I really
19 don't want to have to find the reference, but do you
20 recall that in those days, when you did the modelling,
21 you planned for there to be a bump from selenium -- of
22 selenium from the end-pit lake into Gold Creek in later
23 years, post closure? Does that ring a bell, or do we
24 have to go look for it? It was in Appendix 10B of
25 the --

26 A MR. HOUSTON: Yeah. Yeah. And that -- that

1 was that -- that outfall from the end-pit lake that --
2 because the numbers were slightly higher in that
3 earlier modelling as well.

4 Q Right. It did. It got up to -- I'm working from --
5 I'm literally working from memory, but I think it
6 hit .2 -- so two five or something.

7 A Yeah.

8 Q Okay. So here's my question: Now that you have the
9 end-pit lake decanting into the SBZs, eventually making
10 it into Blairmore Creek, would you expect to see
11 long-term post -- have you done any new modelling, or
12 would you need to, to reflect the now additional
13 loading of whatever selenium might be in the end-pit
14 lake working its way through the SBZs and ending up
15 over in Blairmore Creek in the long-term post-closure
16 period? Not just selenium, for that matter, but other
17 contaminants?

18 A Yeah. Yeah. All the newer modelling has the water
19 flowing in the right direction, so we -- we have
20 included that in the more recent modelling that both --
21 not putting that water into Gold Creek and accounting
22 for the decanting through the SBZ. So that has been
23 included.

24 Q So it has all been accounted for, you're saying. Okay.
25 Well, that's fair enough. I'll move on from that group
26 of questions. Excuse me.

1 And where am I going? Right. I'm going here.
2 What time are we at? 1:58. I think I'll get through
3 this, and after I get through this set of questions, I
4 might ask for a break to recalibrate on where we're at.
5 I'm going to continue to talk about the end-pit
6 lake. Well, can you just give me 30 seconds, please?
7 I just want to clarify something.

8 MR. O'GORMAN: Okay. You know what,
9 Mr. Chair? Can we take a ten-minute break?

10 THE CHAIR: Certainly. It's 2:00, so
11 let's resume at ten after 2.

12 (ADJOURNMENT)

13 THE CHAIR: Okay, Mr. O'Gorman, continue
14 whenever you're ready.

15 MR. O'GORMAN: Thank you, Mr. Chair.

16 Okay. We are getting to the home stretch, folks,
17 so...

18 I'm going to ask you a few questions now about
19 groundwater, in case people thought that we were -- the
20 groundwater folks thought that they would escape
21 unscathed.

22 Zoom Host, can we please look at Addendum 11,
23 Registry Document 313. And we're going to look at
24 PDF 175, at the bottom of that page.

25 Q MR. O'GORMAN: Okay. So at the bottom of the
26 page and then it spills over onto the top of page 176,

1 midway. I'll let you read that -- the first bit.

2 MR. O'GORMAN: Zoom Host, you can -- you can
3 jump probably to -- to page 176, the next page, so
4 we're able to continue reading.

5 Q MR. O'GORMAN: While I suggest that in this
6 IR response, you suggested some potential investigative
7 techniques to minimize --

8 MR. O'GORMAN: Show the top of that page,
9 please, Zoom Host, sorry, so that it continues from the
10 previous one.

11 Q MR. O'GORMAN: You suggested some potential
12 investigative techniques to minimize seepage from the
13 SBZs through things like site-specific characterization
14 of fracturing, including seismic refraction profiles,
15 lines of ground-penetrating radar, and use of drones to
16 identify fractures.

17 Do you guys agree with that?

18 A MR. HOUSTON: That -- that's what we
19 identified in this response, yes.

20 Q Great. Thank you.

21 MR. O'GORMAN: If we scroll down just four
22 pages, Zoom Host, to 180.

23 Q MR. O'GORMAN: So a few pages later, you did
24 state that the -- if you -- on here you should see
25 basically you're telling us the final locations of your
26 monitoring wells are going to target preferential flow

1 pathways, including more permeable fractures and
2 bedrock zones to attempt to maximize the effectiveness
3 of the monitoring program and particularly to early --
4 for early detection of adverse effects. Is that right?

5 A Yes.

6 Q Okay. And we're curious whether -- I'm sorry -- we're
7 curious whether you're committing to employ some or all
8 of those techniques you listed in that list we just
9 discussed to characterize fracturing prior -- prior to
10 finalizing the location of the monitoring wells.

11 A So yes. And I think what's important is that we're
12 going to do what is practical and effective once we get
13 into that stage. So once we've removed the -- the
14 organics and cleared the way, so to speak, then we're
15 going to use the techniques that we consider most
16 effective to assess any fracturing in that -- in that
17 area.

18 Q So you don't know which techniques yet, or do you know
19 which ones you will -- you will commit to doing?

20 A MS. GRAINGER: Good afternoon, Mr. O'Gorman.
21 It's Nancy Grainger.

22 There would be a combination of surface mapping of
23 the fractures and then also borehole examination of
24 fracture features, specifically looking for where we
25 can see -- excuse me -- evidence of flow along
26 fractures, and that's what we would be targeting in

1 groundwater monitoring.

2 Q Okay. And --

3 A I don't know if that's helpful.

4 Q Well, we'll carry on then, regardless.

5 I guess I'm curious to know about your --
6 Ms. Grainger, maybe this would be best for you. Tell
7 us about your confidence level that the techniques you
8 will use will successfully allow to you identify
9 fracturing around the SBZs?

10 A Well, the downhole technologies are what I'm
11 specifically interested in, so advancing boreholes and
12 then either using flow meters or packer tests to look
13 at where we see groundwater movement occurring in those
14 boreholes would be -- and then we would target those
15 zones specifically for monitoring.

16 The initial mapping from the surface, which I
17 think was what we looked at initially, would give us
18 indications of the primary orientations of the
19 fractures that we would be looking for in the
20 boreholes.

21 Q Okay. So that wasn't really what I asked. I'm curious
22 about your confidence level that things like the GPR,
23 the ground penetrating radar; the drones; the seismic
24 refraction profiles, that those will allow you to find
25 the faults?

26 A Mr. O'Gorman, I -- yeah, Mr. Youl is going to provide a

1 response.

2 A MR. YOUL: Yeah. Good afternoon,
3 Mr. O'Gorman.

4 Q Good afternoon, Mr. Youl.

5 A Well, it's morning here.

6 Q Oh, right.

7 A Early morning here.

8 But we've had some good success with
9 ground-penetrating radar across the site. We've used
10 this on the rail loop as a supporting piece of
11 information to the -- to physical bore logs,
12 specifically looking at the different layers of
13 sediments below the topsoil and organic layers, so
14 the -- the siltstones, the sandstones, down to hard
15 bedrock. That technique has been quite successful
16 in -- in identifying those layers.

17 We've also used it across profiles -- across the
18 raw water pond, helping with the information on the
19 design of the dam wall and the foundations of that dam
20 wall.

21 And we've also used it over -- I think I talked
22 about this earlier -- the underground -- some of the
23 underground workings, highlighting cavities and
24 previous workings.

25 I should point out the company we've used for this
26 does a lot of archaeological work, so they've got a lot

1 of really interesting experience. And what we haven't
2 tried yet is three-dimensional ground-penetrating
3 radar, so that's on our list of things to do going
4 forward so -- specifically looking at the underground
5 workings. And then once we clear the vegetation
6 topsoil off the surface of the dumps or the dump areas,
7 we would be looking to do some fieldwork with our
8 geologists, so field mapping, isolating where the
9 formations change, and then some judicious use of shell
10 or penetrating boreholes and possibly augmented with
11 ground radar.

12 So we're pretty confident, with the tools we've
13 got, we'll get a good understanding of the fracturing
14 and potential groundwater pathways.

15 Q Okay. Thanks, Mr. Youl. And, actually, I was going to
16 turn to you next.

17 I could haul up the transcript, or you could save
18 us all the time and tell me whether you remember not,
19 so very long ago, discussing ground-penetrating radar
20 with Mr. Yewchuk from CPAWS. And I think that
21 conversation took place on November 16th.

22 A I'll take your word for it. Yeah.

23 Q He was asking you about whether you found historical
24 mine tunnels on the site. And I can read from the
25 transcript, and you tell me if you would have said:
26 (as read)

1 A technique I was very interested in a few
2 years ago was ground-penetrating radar, and
3 we've used that over part of the initial pit
4 area with considerable success, shown the
5 areas have actually been partially mined.

6 You also said: (as read)

7 We've used GPR to identify areas of primary
8 extraction and also areas where we've seen
9 secondary recovery where sections of the seam
10 have collapsed.

11 So does that -- do we need to haul it up, or do you
12 agree that that's --

13 A No, no, no. I remember that. I pretty well remember
14 that word for word, yeah.

15 Q It was word for word.

16 Okay. I wonder if you -- so our groundwater
17 expert picked up on that and the relation to some of
18 these -- what we were told here about GPR, in
19 particular. If you can tell us, when did you do that
20 on-site GPR work, Mr. Youl?

21 A From memory, we had -- we've had a couple of very short
22 trials. They lasted a couple of days to a week. From
23 memory, probably late 2017 into 2018, about that time
24 period.

25 Q Okay. So I guess I'd like you to explain this --

26 MR. O'GORMAN: And if we can call up Addendum

1 10, Package 5. It's Registry Document 251, and it was
2 a response to -- a response to IR 518. So Addendum 10,
3 Package 5, PDF 111. So it's at CIAR 251, package --
4 yeah. Great. And PDF 111.

5 Q MR. O'GORMAN: So here we had asked you an IR
6 about groundwater -- about groundwater transport and
7 various other things. And at the bottom of the page,
8 it starts with "with regards".

9 MR. O'GORMAN: So if we can blow up the
10 bottom of the page, please, Zoom Host.

11 Q MR. O'GORMAN: And I could have also read,
12 actually -- I skipped some of your transcript, but you
13 did talk about identifying, Mr. Youl -- Mr. Yewchuk was
14 asking you about identifying some of the -- I probably
15 should have read this as well, identifying some of the
16 old underground mining tunnels; that was a part of that
17 conversation you had with him.

18 So I guess, you know, you talked about in this IR
19 response -- well, can you just -- can you indicate for
20 me whether information that you gathered from some of
21 your ground-penetrating radar activities were used in
22 developing this IR response, which came in 2019?

23 A MR. YOUL: I'm just quickly scanning
24 through it. No, I don't believe it -- it was. The
25 ground radar program was -- had a very specific focus.
26 It wasn't so much groundwater. It was foundation

1 engineering for things like the rail loop and the dams
2 and also trying it on the underground workings, which
3 was an add-on, given the interesting information we
4 were getting from the -- the foundation engineering
5 work.

6 So it wasn't specifically targeted to groundwater,
7 but I think going forward this could be a tool. It's
8 not my area of expertise, but certainly looking at the
9 refraction profiles that the surveys produced, there
10 was a lot of useful information there. It needs a lot
11 of filtering in -- you need really specialized people
12 to interpret this data. But, yeah, it shows promise;
13 that's for sure.

14 Q Okay. Ms. Grainger, do you know whether this is
15 something you guys are planning to do? Is that your
16 area of expertise?

17 A MS. GRAINGER: Unfortunately, it's not my
18 area of expertise, so ...

19 Q Okay. Okay. Well, we can carry on. I chuckle whether
20 I should call up this bit of transcript. This is ...

21 Actually, let's go ahead and call up -- it's on
22 CIAR 313, so Addendum 11, on page 176. Yeah, very
23 close to here. So before we agree that -- actually,
24 no. Scan in a bit.

25 Mr. Houston, I actually didn't write down the
26 transcript reference, but I'm going to ask if you

1 recall earlier this week -- I think you were in a
2 conversation with Mr. Secord at the time, and I think
3 he brought up, in a question to you, the idea of
4 grouting, and you had a bit of a conversation about
5 grouting. Should I find that transcript reference, or
6 do you remember that there was some conversation
7 that -- it wasn't a very definitive conversation about
8 it, but do you remember that?

9 A MR. YOUL: Yes, I do.

10 Q I think it was Mr. Houston, actually.

11 A Sorry. I --

12 Q Mr. Houston?

13 A MR. HOUSTON: We -- I can't remember the
14 specific reference. No, I can't -- I can't recall it
15 exactly.

16 Q Okay. Well, at the time -- I will -- here was what I
17 determined: Watching that exchange, you looked a
18 little bit surprised at the -- when he brought up
19 grouting. That may or may not be the case, but I --
20 this is where I remember reading about grouting, is
21 that you folks on here have suggested in this IR
22 response that one of the -- one of the things that you
23 might do to deal with -- where is it on this page? It
24 might be lower on this page, please.

25 One of the things that you considered --

26 A It's -- it's just above (b) there, if I -- it's the

1 point -- the bullet point just above (b).

2 Q Right. Right.

3 You suggested in an IR response to me that, if
4 I -- if I understand this right, that you might
5 consider to address faulting in the base of the -- in
6 the pit, in the floor of the pit, sealing the -- the,
7 you know, fractures by potentially, you know, some
8 sealant or grouting. Is that right?

9 A We -- we talked about -- that we would look at that as
10 a possible way to minimize seepage by grouting if -- if
11 it's determined that that is something that could be
12 done effectively.

13 Q I guess I'm curious: Do you have any examples of
14 coal-mining operations that grout the floor of their
15 mine pits to prevent seepage? Do you have any examples
16 of that --

17 A No.

18 Q -- that you know of, Mr. Youl? Mr. Youl, have you ever
19 seen that in coal-mining operations or any mining
20 operations? Obviously, we're not talking about
21 grouting and sealing dams; we're talking now about the
22 floor of your pit.

23 A MR. YOUL: I haven't personally seen it.
24 I have spoken to people who have been involved in
25 mining through underground workings, and they've used
26 that -- a pumped grout where there's, I guess, a lot

1 more common surrounded volume of grout they need, but I
2 haven't seen it used in a more, I guess, broad sense
3 under a dump, that sort of thing.

4 Q Yeah. I guess we're wondering -- go ahead. Sorry.

5 A MR. HOUSTON: No. I was just going to add,
6 Mr. O'Gorman, that one of the things we've talked about
7 from the get-go with this project is that we're not
8 talking about the historical practices. And
9 recognizing that selenium and -- and water management
10 is one of the foundations of this project, we're --
11 we're looking at doing things possibly differently than
12 they have been done in the -- in the past. So I -- you
13 know, I -- what was done in the past may not
14 necessarily dictate what's done in the future, I guess,
15 is what I was going for there.

16 Q Okay. Well, anyway, I just wanted to ask a little bit
17 about that.

18 I will ask groundwater questions here.

19 MR. O'GORMAN: Could we please, Zoom Host,
20 call up -- we're on 313 still -- sorry, Addendum 11.
21 Let's look at PDF 311. Let's look at the bottom-ish of
22 that page.

23 Q MR. O'GORMAN: So we're looking -- focusing
24 in on the south rock disposal area and the central --
25 yeah, that works. So I think we see that the two large
26 formations we're all familiar with now of the central

1 and the south RDAs here; right? Everyone can see that,
2 or Mr. Houston?

3 A MR. HOUSTON: Yes.

4 Q Great. So you'd agree that the -- both of those are
5 relatively close to Gold Creek?

6 A Yes. They're on the east side.

7 Q Right, the east side.

8 The dotted blue line that starts at the bottom and
9 we can follow it up, that's sort of a dividing line
10 between which direction that groundwater is going to
11 flow, and it's the line that, you know, tracks up --
12 actually, only a tiny bit of the SRDA is on the east
13 side of it, but then the central -- it continues up and
14 goes to the central RDA. And a healthy amount, let's
15 call it, of the central RDA is on the east side of
16 that -- that groundwater flow line; is that right?

17 A Yes.

18 Q Okay. So this figure shows proposed monitoring well
19 locations. Sorry. And also, it shows, I think you'll
20 agree, the southeast surge pond, which is the big
21 purple blob next to Gold Creek, and we've talked about
22 that before.

23 So we're seeing three monitoring wells on here.
24 We see right next to the southeast surge pond
25 MW19-16-7; right?

26 A Yes.

1 Q And then there's MW14-1 and 11-1 that are a little
2 bit -- relatively near, MW14-1 at the bottom and 11-1
3 sort of on the upside of -- of the surge pond, if I can
4 characterize it that way. Does that makes sense to
5 you?

6 A Yes.

7 Q Okay. So I've covered that.

8 And I do want to also now look at a different
9 picture, which is going back to the original EIS, so
10 CIAR 42 and Consultant Report 3, please. And we're
11 going to look at page 12 -- 112. So the original --
12 yeah, CIAR 42, Consultant Report 3. Registry
13 Document 42, Consultant Report 3. Is that where we
14 are, Consultant Report 3?

15 A I think we're in the wrong document here.

16 Q I think we are as well.

17 MR. O'GORMAN: So, Zoom Host, we're looking
18 at the original EIS, Registry Document 42, within that
19 Consultant Report 3.

20 A MR. HOUSTON: Is it the map of predicted
21 groundwater travel time that you're looking for?

22 Q MR. O'GORMAN: It is. It is the map of
23 predicted groundwater travel time on PDF 112, yes.

24 Mr. -- I mean, Mr. Houston, you obviously have the
25 figure there in front of you?

26 A Yes, yes.

1 Q So I guess can I ask you: Although that figure is for
2 long-term closure, it does illustrate the residence
3 times, right, for the -- for groundwater flow to -- how
4 you would characterize it -- to make it from that point
5 to outflow in a stream?

6 A Yes.

7 Q Is that the idea?

8 A Yes.

9 Q Okay. Do you believe -- although that diagram was for
10 long-term closure -- there's the picture -- do you
11 believe that -- during operations that the residence
12 times would be appreciably different?

13 A One minute, Mr. O'Gorman.

14 A MS. GRAINGER: I can answer that,
15 Mr. O'Gorman. Yes, I think the residence times would
16 be different during operations. This is the long-term
17 closure scenario.

18 Q Thank you, Ms. Grainger.

19 How did you say my last name?

20 A "O'Gorman".

21 Q Good.

22 A I think I misspoke before, and I apologize.

23 Q Well, Mr. Niven weighed in on the -- his preference for
24 Scottish surnames over Irish ones. I almost
25 interjected at the time to have him removed from the
26 hearing. I chose to ignore it, but I do feel an

1 importance and attachment to the 'O' in my surname.

2 A I'm sorry.

3 Q Okay. That was in jest, obviously, for the record.

4 Okay. So having demonstrated those -- and lost my
5 place, of course, while I was joking. So we don't --
6 the southeast portion of the mine footprint, relatively
7 short predicted residence times in groundwater, yes?
8 In fact, the reddish blob that we see in the centre of
9 that picture is some of the shortest potential
10 residence time, and that's pretty close to where the
11 surge pond -- the southeast surge pond would be sort of
12 close, at least; right?

13 A That's correct, yes. And the red is 0 to 10 years.

14 Q Right. Obviously, we all know by now that Gold Creek
15 is a sensitive surface water receptor in the same area;
16 correct?

17 A Correct.

18 Q And -- oh, sorry. All right. Also, we've heard the
19 adjacent landowners to the mine permit that are on that
20 side discuss their concerns.

21 So now if we look back at what we were looking at
22 the last time, the proposed monitoring network, which
23 is the last document we had, CIAR 30 -- 313, page 311.

24 A Yes.

25 Q Okay. We're thinking about --

26 MR. O'GORMAN: So it's Registry Document 313,

1 page 311. It's the graph we had up literally right
2 before this, the thicker. Right. And scan in, please,
3 on -- around the purple southeast surge pond near the
4 -- near the bottom just a bit so we can see a bit more
5 clear. Great. Scan over on the page a bit to your
6 right. Great.

7 Q MR. O'GORMAN: So we're looking at the
8 density of proposed monitoring wells here. We've
9 identified them a minute ago. Can you clarify whether
10 you've committed -- I also see, for your benefit, the
11 legend describes that little purple dotted area around
12 the surge pond as --

13 MR. O'GORMAN: Well, let's scan down to see
14 what the legend says about that line, Zoom Host. See
15 the legend and over a bit to the other side? Oh, just
16 scan a bit to the left, sort of.

17 Q MR. O'GORMAN: I think it's described as
18 "proposed area for groundwater wells"; right? I think
19 that's what you were telling us in this graph, if I --
20 if I'm reading it properly.

21 A MS. GRAINGER: That's what the legend says,
22 yes.

23 MR. O'GORMAN: Okay. So let's scan back a
24 bit to the -- to the right side of that page, please,
25 Zoom Host.

26 Q MR. O'GORMAN: Can you clarify whether you've

1 committed to increasing the density of groundwater
2 monitoring wells in this area? You know, these are
3 what you've proposed. Are you proposing -- is this all
4 you're proposing, or will there be more?

5 A MS. GRAINGER: This was a very preliminary
6 indication of -- of potential distribution. To be
7 honest, much of this was limited by -- you know,
8 they're located in the generally downgradient direction
9 of features and based on access which will need to be
10 reviewed, because, as we describe in the documentation,
11 the monitoring wells need to be placed close to
12 potential sources, and -- and a pathway needs to be
13 reviewed in terms of: Are these actually located at an
14 appropriate distance and depth such that they would
15 intercept the groundwater pathway before reaching a
16 receptor?

17 So there's additional work that's needed to be
18 done before this would be finalized.

19 Q Okay. Thank you, Ms. Grainger.

20 Mr. Houston, I guess, from a higher level, you
21 would -- would you agree that this was one initial --
22 you know, what the monitoring wells might look like,
23 but is this what you're committed to, or is the real
24 plan on monitoring of groundwater still to come?

25 A MR. HOUSTON: So I think the plan on
26 groundwater monitoring will be modified with the

1 detailed design phase. You know, the shape of that
2 surge pond and the exact location needs to be
3 finalized. And so I -- I expect that with that work
4 and as that gets finalized, that groundwater monitoring
5 wells could be located more precisely.

6 Q And if, in a potential approval condition, for example,
7 were we to get to that point, you were to see proposed
8 required minimum density of groundwater monitoring
9 wells which were more dense than what we're seeing in
10 this figure -- if you were to see that, how would you
11 react to that?

12 A So my -- my understanding is that the cost of
13 groundwater monitoring wells is -- is not that great.
14 I wouldn't want to see, you know, an arbitrary design.
15 I would rather -- I would rather have a situation where
16 we could discuss that with the Regulator after the
17 detailed design is done and agree on something that
18 makes sense based on the -- the final design.

19 Q Okay. So I guess the -- I'll be honest; the extent to
20 which this was made clear in some of the conversation
21 we had this week about groundwater escapes me, so I
22 don't think I'm treading over ground that we have
23 already covered, but maybe I am. And if so, feel free
24 to correct me.

25 But if I look at Monitoring Well 19-16-7, which
26 is -- okay. Even if that's just conceptually

1 monitoring potential seepage from the surge pond,
2 which, as we know, contains selenium -- selenium laid
3 in the contact water and is -- I think we can at least
4 characterize as being very close to Gold Creek. And
5 knowing that we just looked at a graph of residence
6 time of groundwater and that that area is one of the
7 lowest designations you've assigned for residence time
8 of groundwater, the question, I suppose, somewhat
9 obviously, is: What confidence can we have that by the
10 time you detect a problem, you have time to fix it
11 before it gets into more heavy selenium loading into
12 Gold Creek?

13 A So I -- I'm going to start this, and then if
14 Ms. Grainger wants to chip in, she can.

15 So I -- I think that we heard from Mr. Youl
16 yesterday or the day before talk about keeping that
17 surge pond relatively empty and trying to favour having
18 the water in the raw water pond, and that's just an
19 operating matter.

20 So I think when we were looking at this, the --
21 the potential seepage from the off -- the out-of-pit
22 storage pile was the more important aspect here, and
23 that's why we've put that MW11-1 closer to the
24 off-site -- or out-of-pit storage area, to detect any
25 seepage that's coming directly from the rock pile.

26 So I -- I don't know if I'm getting to your --

1 your question here, but I think in our analysis the
2 greater concern, from a seepage point of view, was the
3 rock dump and not so much the surge pond.

4 Q Okay. And no -- nothing else for anyone to chip in on
5 that question? You just alluded to it, Mr. Houston, so
6 I'm not advising it, but ...

7 A I'm looking down the table, and she -- yeah. No. I --
8 I think we're good there, Mr. O'Gorman.

9 Q Okay. Thank you.

10 The last question in this topic.

11 MR. O'GORMAN: Let's go to the very -- the
12 most recent Addendum 12, it's Registry Document 360.
13 And we're going to look at -- so 360 document. You
14 guys can find PDF 88 and look near the bottom of the
15 page while we're waiting to see it on the screen. It's
16 Registry Document 360, Addendum 12, and PDF 88. Great.

17 Q MR. O'GORMAN: So these were some commitments
18 that you had made.

19 MR. O'GORMAN: I'm not going to ask -- don't
20 bother blowing it up, Zoom Host.

21 Q MR. O'GORMAN: I'm sure it takes --
22 Mr. Houston, you and your team can see that on your
23 computers --

24 A MR. HOUSTON: Yes.

25 Q -- where you are?

26 It shows commitments you've made in Addendum 12

1 around some of the issues I've been discussing here.

2 I guess, can you summarize first what you're
3 committing to in terms of, you know, preventing seepage
4 from the RDAs and the surge pond to keep selenium and
5 other contaminants out of groundwater and ultimately
6 out of Gold Creek?

7 A So just -- just focusing on the commitments that are --
8 are written in this table, as we heard Ms. Grainger say
9 earlier, that -- and Mr. Youl as well, that before we
10 start putting rock into the ex-pit rock dumps, our
11 intent is to use various techniques to identify any
12 fracturing and -- and to identify potential flow paths
13 and that that initial work would inform the location of
14 monitoring wells. And those would be located
15 downgradient, obviously, of -- of the waste rock dumps.
16 Similarly, we would locate down -- downgradient from
17 the surge pond's monitoring wells.

18 And, you know, I know we only showed one well in
19 each location on that conceptual drawing, but if -- if
20 there were multiple flow paths of -- of interest, as I
21 mentioned, a monitoring well isn't very expensive to
22 install, and we would -- we would do -- we would
23 install them at -- at logical locations, and that would
24 be discussed with the Regulator, so -- and that's to
25 detect quantities and the quality of water that is
26 seeping from those structures.

1 The -- the construction of the waste rock dumps
2 will -- will attempt to facilitate drainage from the
3 waste rock dumps, including under drains using
4 end-dumping techniques to get -- get a permeable layer
5 at the bottom and collection ditches at the toe and
6 underneath the waste rock dump to facilitate the
7 drainage of that water and avoid pooling of water
8 inside those -- those structures.

9 And then we have foreseen that seepage capture
10 wells would be required, and those were located on that
11 other drawing around the periphery, downgradient
12 periphery of the surge pond. But, again, those would
13 be located in logical locations based on what we
14 understood of the groundwater migration pathways
15 from -- from the waste rock dump areas primarily.

16 Q And you are not planning to put a liner at the bottom
17 of that surge pond; is that right?

18 A Not at this point. A lot's going to depend on what we
19 find when we do a more thorough investigation of the --
20 the base. A liner is a possibility or perhaps --
21 although we don't have clay on-site but some form of
22 less permeable base on the -- on the pond. But that's
23 going to depend on a more detailed investigation once
24 we -- once we get in there.

25 Q Okay. I think we can move on from this area. Thank
26 you, Mr. Houston and others.

1 So I'm going to move to my last substantive area
2 of questions. I'm going to raise a different area at
3 the end, so this isn't really -- but I will do that
4 fairly -- potentially fairly briefly.

5 Well, I guess there's one pretty obvious topic
6 that we haven't -- I haven't asked you about in my
7 extended period of, you know, questions, and those
8 would be the westslope cutthroat trout. So I've got a
9 few questions to put to you on this. Obviously, this
10 is an issue that's been discussed at length already
11 this week.

12 MR. O'GORMAN: Let's start, please, by
13 putting up Registry Document 44, which was Addendum 1.
14 We're going to look at Appendix A3 in that package, and
15 we're going to go to PDF 94, please. We should be
16 looking for Table 4-1. So it's CIAR 44, Appendix A3,
17 Zoom Host. Great. Let's blow that up a little bit,
18 please. Not too big, though.

19 Q MR. O'GORMAN: So in this table you provided
20 us with a table of predicted habitat changes over a
21 period of 2017 to 2099 for all mine phases. We've got
22 changes in total area-weighted suitability habitat for
23 Gold Creek that indicate a modest reduction in habitat
24 suitability for all bio periods. However, I think --
25 so you agree with that, if we can see the -- where on
26 this table is that? There's Gold Creek habitat. The

1 different reaches are described here. And the
2 reduction in AWS, where is it on this figure? Where
3 should we be focusing our eyes?

4 A DR. BEWLEY: Hi, Mr. O'Gorman, this is
5 Dan Bewley. Maybe I can help to describe this table.

6 Q Sure. Yeah.

7 A So the is reduction in habitat is -- you see for each
8 period of the mine, you'll see a "Percent AWS" column.
9 And this kind of goes back to our discussions
10 yesterday. So that's the kind of average loss of
11 habitat for each given by bio period. And we also --
12 that's a chronic measure, we also have a more acute
13 measure, which is the one-month maximum loss of
14 habitat.

15 Q Right.

16 A And this -- this is one of three tables. This is in
17 average hydrological conditions. On the next table
18 we -- we stress it under a sensitivity analysis in a
19 dry year. And the table is extreme stress, drought
20 year.

21 Q Okay. My challenge is I can't read these things
22 anymore because my eyes are -- and I didn't remember
23 where that was in this table.

24 So here's my question: It seems, though, that
25 most of the reaches show a modest reduction, but
26 Reach 5 shows a small increase. Is that right,

1 Mr. Bewley?

2 A That would be right.

3 Q Okay.

4 A And if you'd like me to explain that, I can.

5 Q Yeah. It's stated earlier, and we -- it's on page 91.
6 A few days ago -- I don't think we need to go -- you
7 did -- you have some text a few pages ahead of this
8 that describe why Reach 5 is in a different -- I wonder
9 if you could just, considering the trend we see for all
10 the other reaches, tell us why Reach 5 is different.

11 A Sure. Zoom Host, can we go up to page 87 of this
12 document, and can we kind of zoom in on the bottom
13 figure, please. Thank you. And just scroll up a bit
14 more.

15 So, yeah, at a high level, this, again, is a flow
16 habitat graph for each of the bio periods. And what
17 you can see is that, you know, the optimal amount of
18 habitat is obviously when each curve peaks at its peak
19 value. So this is fairly standard. Again, the point
20 of a detailed flow assessment is to really -- you know,
21 we're trying to capture how habitat exponentially
22 declines down to zero flow. Okay?

23 Based on each curve's -- each life stage's habitat
24 suitability to stream width, depth, and substrate, they
25 will show varying responses to changes in flow. I --
26 if I remember rightly, with Reach 5, what you start to

1 see at a certain flow and above is that some of those
2 life stages actually change above that zero flow.

3 So it depends on kind of what the flow is. If we
4 lose a certain flow, you may actually get an inverse
5 relationship with habitat. And that's kind of, you
6 know, how these curves are captured.

7 Q Okay. And that's specifically what happens in Reach 5?

8 A Well, if you -- yeah. If you compare a kind of --
9 it's, like, a blue curve, "rearing juvenile WSCT".
10 This slightly slants down in Reach 5, and you can see
11 it's slightly slanting up in Reach 6. So it's all
12 dependent on, you know, the changes in the hydraulics
13 between the reaches, and they do vary based on our
14 measurements and monitoring and analyses. There's
15 going to be slight difference in reactions between the
16 different reaches. Okay?

17 Q Okay. I guess what I'm curious about is: Why do we
18 see that trend, that specific thing happening in
19 Reach 5, when all the other reaches, the opposite trend
20 evidenced itself?

21 A Okay. So for the flows in this reach -- like, let's
22 just take a hypothetical example. Let's just say that
23 at a flow of .6 in Reach 5 -- let's go up to the black
24 line. Okay? I see a value of -- AWS of 3.0, okay, at
25 a flow of .6. So when we talk about losing flow
26 between the reaches, which I believe we're talking

1 about in Reach 5 as well, you're actually gaining
2 habitat when you go from .6 to .5 to .4 to .3, and then
3 you start to exponentially reduce inflow as we approach
4 those zero-flow conditions.

5 So you can lose flow, if you follow the black
6 line, and you will reach an optimum point, and then you
7 will get down into that fast decrease. So it's --
8 essentially, you've got to piece together -- and maybe
9 I could have done this in a more clear -- clearer
10 manner. You've got to figure out: What is the
11 starting flow? And, you know, if you're losing flow,
12 you may actually increase for different life stages
13 based on these curves that you see here.

14 Q That works, Mr. Bewley. Thank you.

15 A Okay.

16 Q Okay. Next question: Are we in -- we're in 44, yes,
17 and we're in Appendix A3. So let's look at page
18 PDF 95, just a few pages later.

19 Now, I think we are going to look at -- and you
20 just referred to this, Mr. Bewley. You had normal
21 flow. Then you had AWS tables for 1-and-10 and
22 1-and-20-year dry conditions in Tables 4-2 and 4-3;
23 right?

24 A Correct. Yeah.

25 Q Okay. And we're talking about Gold Creek here.

26 So the individual -- in the 1-in-10-year drought,

1 if you look at the individual monthly time scales, it
2 seemed like there were more worst-case habitat losses
3 exceeding 10 percent -- they're in the range of 11
4 to 19 percent -- relative to average hydrological
5 conditions, and they occurred for adult and juvenile
6 rearing and spawning bio periods in Reach 8 and 9 and
7 also Reach 6. Do you agree that that's what we see
8 here?

9 A Absolutely. And that's the whole point of this
10 sensitivity analysis. And, you know, I could say let's
11 go down to the page below where we're stressing the
12 habitat even more.

13 Q That's exactly what I was going to ask us to do. So if
14 you went to the next page --

15 A (INDISCERNIBLE - OVERLAPPING SPEAKERS)

16 Q -- tell us how to think about --

17 A (INDISCERNIBLE - OVERLAPPING SPEAKERS)

18 Q So Reach 8 and 9 is right above Caudron Creek, and
19 Reach 6 is Lille. So --

20 A Yeah.

21 Q -- so explain how it looks, then, under 1-in-20 here.

22 A So essentially what's happening here is between these
23 different sensitivity analyses, we have more flow,
24 obviously, in the average conditions. We lose a lot of
25 the flow in the -- obviously, in the 1-in-10-year
26 drought, and we lose even more flow in the 1-in-20-year

1 drought. And kind of if you compare just -- you can
2 compare the baseline values between these different
3 conditions, and what we're doing is, because we're
4 losing flow as we get more extreme droughts, we're
5 losing habitat. And as I've just shown you on those
6 AWS codes, once you get closer to those very low flows
7 and there's any residual impact on those flows because
8 of the project, we are exponentially increasing our
9 loss of habitat. Okay. That's the whole point of
10 these detailed flow assessments.

11 Just to go back to your 9, 8, and 6 example, this
12 is -- this is a big source of our concern, and extended
13 monitoring efforts are definitely above Caudron in 9
14 and 8 and in 6 as well, at Lille. This is where we
15 have those very low-flow environments.

16 And if you remember Mr. Houston's green spaghetti
17 map, shall we call it, of the different kind of flow
18 rates in different hydrological conditions, this is why
19 we set up most of our monitoring in these kind of
20 lower-flow transects, especially 9 and 8, because they
21 are the lower-flow environments. We really want to
22 characterize, you know, for any given flow, what do
23 those stream hydraulics look like, stream widths,
24 stream depths, and substrate.

25 So because any residual project impacts will be --
26 as you are seeing in these tables here, they will be --

1 there's -- there's more impacts on habitat that we
2 potentially have to offset for in these lower-flow
3 reaches, and that's why we're gearing up with the huge
4 amount of monitoring that's going on in these low-flow
5 reaches.

6 Q Okay. And I guess a 1-in-20-year drought, would you
7 agree that it would not necessarily be unexpected to
8 occur over the course of your mine, which runs for
9 23 years?

10 A It would be very low risk. I'm not going to say
11 absent.

12 So let's just -- you know, what is a 1-in-20
13 drought? It's a -- it's a condition that has a
14 5 percent probability of happening in any one year.
15 Okay?

16 What -- what would be the absolute worst-case
17 scenario is if that would happen to occur in the late
18 2031s and early 2040s, which is kind of essentially
19 that period when the flow impacts are estimated to be
20 worse. So if you kind of overlay those two cumulative
21 impacts, that would be when -- when the highest impacts
22 would occur.

23 But, again, we're talking risks. You know,
24 5 percent on this average -- the 1-in-20-year condition
25 against that short time frame. But there's -- you
26 know, all these calculations that you see here, this is

1 kind of -- they feed into the -- the offsetting
2 calculations and all the potential mitigation
3 discussions that need to be had over the time.

4 But I would like to say, like, if there's any --
5 we've been talking about things like climate change
6 and, you know, the monitoring and all that kind of
7 stuff. This is where -- this is a good example, I
8 would say, where we're actively adding conservatism in
9 the different analyses that we're doing. We're --
10 we're really stressing the -- the habitat and the flows
11 to see, you know, what that habitat losses may be and
12 what may need to be done to kind of mitigate against
13 seeing these losses.

14 Q Okay. And I guess I just -- one of the takeaways, if
15 you were to scan your eyes around this table, you
16 would -- you'd agree that in the -- in a -- in the
17 1-in-20-year drought conditions, you are showing for
18 certain reaches and life stages almost a 20 percent
19 decrease in habitat -- AWS habitat; right?

20 A Yeah. That -- that's correct.

21 Q And --

22 A Just to --

23 Q (INDISCERNIBLE - OVERLAPPING SPEAKERS)

24 A Yeah. And just to confirm, like, you know, it's --
25 some of our concerns regarding life stage have to do
26 with, you know, when do the life stages occur?

1 So bear with me one moment.

2 Anything that kind of transcends into lower-flow
3 months is -- is a big concern to us. It's -- you know,
4 if you're doing calculations in May and June alone,
5 it -- it's going to take those -- those flows. Whether
6 it's in an average condition or a drought condition,
7 there's still so much water in May and June, okay, that
8 the impacts, if you are regarding those particular
9 months, may not be so high.

10 We're really trying to dial in -- into the
11 lower-flow months that -- you know, I think I was
12 discussing with Ms. Janusz; if those droughts happen in
13 summer for a longer period of time or are more
14 extensive, these -- these sensitivity analyses that you
15 see kind of give us a snapshot of if that occurrence
16 were to occur, like, you know, how -- you know, if --
17 if -- the fire stage, say, for example, July, August,
18 September, if we do lose some flow naturally to the
19 climate, what might be the -- the impacts on the
20 habitat? And these -- these tables kind of give us a
21 snapshot through to -- you know, if climate change
22 contributes to the picture moving forward.

23 Q Okay. So I guess I'm curious, given some of the
24 predicted changes we see in the 1-in-10 and 1-in-20
25 drought-year scenarios here, that you do see predicted
26 exceedances of a 10 percent reduction in threshold --

1 in -- in habitat under some of those scenarios. Can
2 you explain why you -- in your overall assessment of
3 the impacts on this value component, you didn't
4 identify -- identify those reductions as being a
5 significant change?

6 A MR. HOUSTON: If I could step in on this
7 one, Mr. O'Gorman. The effects assessment is based on
8 a -- after mitigations. This -- this analysis is
9 before mitigation. So when we think about the
10 offsetting plan that we're -- we've proposed,
11 including, you know, putting the creek back into its --
12 its old historic channel and increasing overwintering
13 habitat, those -- that offsetting plan increases the
14 amount of habitat available in the stream, and so
15 that -- that is -- that's why we call it "offsetting".
16 It's a -- with that mitigation, we -- we can say that
17 the effect will be not significant.

18 Q Okay. I guess we're wondering why -- I mean, I think
19 you proposed that 10 percent was the threshold; right?

20 So --

21 A After mitigation.

22 Q After mitigation. Okay.

23 Let's go to my next question here.

24 A DR. BEWLEY: Mr. O'Gorman?

25 Q Yes.

26 A Could I just add to that?

1 Q Yeah.

2 A Yeah. Just regarding the 10 percent, I can add some
3 clarity there, or if you want to speed up. I do have
4 a --

5 Q I --

6 A Sorry. The 10 percent average loss of habitat is -- is
7 a -- it's been used in other detailed instream flow
8 studies, one of which was the -- there's a landmark
9 study in the South Saskatchewan River, Clipperton,
10 et al., but they -- again, they used a 10 percent
11 chronic loss of habitat as that first precursor to
12 significant impacts on the -- the habitat. Okay?

13 Those guys also used more acute indices and, you
14 know, one example might be a 25 percent loss of more
15 instantaneous or weekly habitat. You are getting into
16 kind of weekly time steps in that particular case.
17 We've concentrated on a monthly time step in our data.
18 So just to add some context to that.

19 Q Right. Okay. Let's move along and go to the next
20 question. Without having to haul up and look at it,
21 maybe, Mr. Bewley, you can -- if I suggest to you that
22 your results show us that you have some of your
23 greatest predicted habitat losses resulting from the
24 project occur in the 2038 to 2042 time period, around
25 when operations are concluding and decommissioning
26 begins, would you agree with that, or do I need to haul

1 it up and have you explain it?

2 A No. I'd agree with that.

3 Q Okay. So can you tell us why the flow reductions are
4 expected to be more prominent in that time period and,
5 by extension, the potential impacts on -- on habitat?

6 A Can you just give me one small minute for that answer,
7 please, Mr. O'Gorman?

8 Q Yes. Yeah.

9 A Thank you.

10 MR. O'GORMAN: You can probably take this
11 down, Zoom Host. Although, you know what, leave it up
12 because we might -- we might be circling through this a
13 little bit more. My bad.

14 A DR. BEWLEY: Thanks for the wait,
15 Mr. O'Gorman.

16 So I'm going to pass over to Mr. Jensen here, who
17 produced those numbers. Thanks.

18 Q MR. O'GORMAN: Okay.

19 A MR. JENSEN: Yes, Mr. O'Gorman.

20 So the way, you know, flows are counted for or the
21 difference in flows, I would say, is -- is proportional
22 to -- to the estimated, you know, changes to the
23 catchment. You know, as the mine progresses, it -- the
24 catchments that are willing to develop mine footprint
25 starts to encroach -- encroach more and more on -- on
26 the Gold Creek catchments. So by the time you are at

1 the extent -- at the ultimate extent of mining, that's
2 when you also see the maximum rate of diversion away
3 from -- you know, sort of the switch in -- in catchment
4 from Gold over to Blairmore, which is what accounts for
5 the -- for the reduction of (AUDIO FEED LOST).

6 Q And did you -- sure. Actually, it does, Mr. Jensen. I
7 read that part of your -- your water modelling quite
8 well.

9 But remind me whether or not progressive
10 reclamation that you said you'll be doing factors into
11 that in terms of, you know, those coefficients for the
12 different pieces of that -- of the watershed and how
13 the water flows. Does that change? Did you factor in
14 progressive reclamation to those?

15 A Yes. We -- we --

16 Q You --

17 A We did. But, I mean -- so keep in mind that the last
18 areas to be developed are those up in the northeastern
19 section of the property. So that's why we see -- you
20 know, so those, by extension, would also be the last
21 areas to be reclaimed.

22 Q Okay. Okay. Tell us about -- Mr. Bewley or -- well,
23 whoever is the right person for this. It might be you,
24 Mr. Bewley. Tell us about what potential mitigations
25 you could enact to ensure that flows remain at baseline
26 in Gold Creek rather than undergoing some of the --

1 some of the losses that we see here.

2 A MR. HOUSTON: Additional mitigations to
3 maintain the flow rates in -- in Gold Creek is what I
4 understand you're -- you're asking, and --

5 Q Yes. And I mean above and beyond sort of, you know,
6 what an offsetting plan -- I'm actually talking about
7 maintaining the flows in Gold Creek.

8 A Yeah. Yeah. And so our offsetting plan, to be clear,
9 is focused on habitat and -- which is what the fish
10 experience, is the existence of the habitat.

11 Increasing flow rates in Gold Creek, the reason
12 that the flow rates drop in Gold Creek and -- and that
13 water somehow gets transferred over to Blairmore Creek
14 is -- is an artifact of our water management program,
15 which sees all of that treated contact water arriving
16 in Blairmore Creek and -- and none of that being turned
17 back to Gold Creek.

18 So we -- we haven't planned any mitigations to --
19 to put the water back into Gold Creek physically.
20 That -- that overflow from the end-pit lake, which we,
21 you know, recently discussed, was one of the thoughts
22 in that direction, you know, and -- and, of course,
23 making sure that all of the water from Caudron Creek
24 south, you know, remains in the creek bed. You know,
25 that -- that would be another mitigation in that area.

26 Beyond that, we -- we would be looking at

1 innovative or completely out-of-the-box solutions like
2 potentially drilling a well or something that could
3 feed into the headwaters of Gold Creek or something of
4 that nature.

5 Q Yeah. I mean, we're, I guess, particularly interested
6 in that time period of greatest reduction in habitat
7 and flows, 2038 to '42 in your modelling; right?

8 A Yeah, yeah.

9 Q What if you get a drought year one of those years?

10 A Yeah. No. And so we've -- we've talked notionally
11 about the -- 'cause we're not talking a lot of water in
12 those upper reaches, and so we've talked notionally
13 about, you know, drilling a well, for example, to have
14 an additional source of water that could be available
15 for Gold Creek, and that would not have any of the
16 mine, you know, contact water concerns related to it.

17 So we have talked notionally about that, but, you
18 know, that's not part of our application. It's just
19 you asked me hypothetically what could be done, and
20 that's one of the things we've discussed.

21 Q Okay. I'm going to ask you -- that's fine. I'm going
22 to ask you if -- for this next question, rather than
23 hauling it up, I'm going to suggest to you and see if
24 you agree that in this document, if were you to look at
25 page 103, not very far away, what you --

26 MR. O'GORMAN: So, Zoom Host, you don't have

1 to -- you might as well go to 103. Why not? But I'm
2 going to -- I'm going to speak while -- while you do.

3 Q MR. O'GORMAN: We see in this -- where am I?
4 I've lost my -- I've lost my place on the page.
5 Sorry -- project effects are predicted to increase
6 flows downstream of Reach 5. Now we're looking at
7 Blairmore Creek relative to the baseline period
8 beginning at construction, carrying on. Some of the
9 flow gains of 10 percent or higher are predicted
10 primarily during winter and some fall months during
11 certain of the operation's years. And most months in
12 2042, including January, was when we see the largest
13 individual monthly flow gain of 33 percent.

14 Does that all sound right, what I just said, in
15 terms of what this graph is telling us?

16 A MR. HOUSTON: Yes, it does, Mr. Gorman --
17 O'Gorman. Now you got me doing it.

18 So, yes, it does. And -- and that modelling
19 reflects a uniform discharge from the water treatment
20 facilities. So the -- so the effect of that discharge
21 is greatest in the lowest-flow months. And as we
22 discussed earlier, they're -- there would be some
23 flexibility to -- to manage that, if needed.

24 Q Okay. And why is the greatest increase in 2042?

25 A Mr. Jensen will answer that.

26 A MR. JENSEN: Yeah. So it's because in

1 2042, at least in this revision of the model, is when
2 you have the greatest extent of unreclaimed mine
3 developments, so that's where we are assigning --
4 because there's no evapotranspiration from mine working
5 slide that we're designing at a greater runoff
6 coefficient, and then as -- as the areas become
7 reclaimed, we then, you know, reassign a natural runoff
8 coefficient. But there's some residual areas, you
9 know, that -- like, the high walls and whatnot, that
10 remain at a higher runoff coefficient. So it -- the
11 short answer is: It's the greatest extent of developed
12 mine areas.

13 Q But it's strictly due to the changes in the runoff
14 coefficients that get applied to the different little
15 chunks of land in your model; right? It's not -- yes?

16 A Yes.

17 Q Right. Not due to --

18 A Well --

19 Q -- decommissioning of some water treatment structure,
20 for example?

21 A Actually, I should say that, and then the water
22 inventory. Because you'll see a reduction in -- in
23 discharges as the various saturated zones are filling
24 up. So we're accounting for not just a runoff but also
25 the -- we're tracking the inventory of water on-site.

26 Q Not extra water flowing out of the SBZ?

1 A I don't know what you mean by "extra".

2 Q I don't know. Accelerated amount of discharge from the
3 SBZ, for some reason, in that time period. Is this --
4 that's not why you're --

5 A No, no. No, it's not. No. It really is the -- so --
6 right. So the increase is due to the -- the runoff
7 consideration.

8 Q Okay. Great.

9 A Correct.

10 Q That's what we wanted to know.

11 A Yeah.

12 Q Okay. Let's look at the next here. If I look at pages
13 PDF 1 -- where am I at? So let's jump down to 105, and
14 we're over a couple of pages. And from 105
15 through 107, which is the three -- I think the three
16 different -- you know, irregular years and then the
17 drought years.

18 Can you tell us whether these tables reflect the
19 same sort of increases in flows in 2042, in that sort
20 of time frame that we talked about on the other graphs?

21 A DR. BEWLEY: Hi, Mr. O'Gorman.

22 So with Blairmore it's obviously a different
23 situation, as we've talked about. Flows are predicted
24 to increase. So I think what we've got here are
25 offsetting effects on flows that we're talking about.
26 The project is scheduled to increase flows, but if we

1 then add stress or drought, then that -- the drought
2 will obviously offset some of those flow increases that
3 we see from the project. So there's a few things going
4 on.

5 But generally, yeah, the two offset, which is why
6 you don't see much in the way of reduction between the
7 scenarios or increase, would be my answer at a high
8 level, if that makes sense.

9 Q So if I asked you to explain sort of predicted changes
10 in AWS resulting from some of those predicted increases
11 in flows that we saw in the other -- other figure?

12 A Then, yes, it would be a case of going back to the
13 relevant flow-stroke habitat curves and talking through
14 those.

15 Q Okay. Do the increases in flows change your AWS
16 results enough to produce a residual effect on the
17 ecosystem that would be large enough for you to
18 potentially characterize it as significant?

19 A Do you mean -- sorry. Would the habitat increase by
20 more than 10 percent, or are you asking if there's some
21 way of habitat reducing by more than 10 percent?

22 Q Well, you said that increased flows can decrease AWS;
23 right?

24 A Oh, I see. Yes. The answer is: No, those increases
25 in flow would not be realized as a stream condition
26 where things are too turbulent and fast for the fish.

1 Essentially, what we find is that, yeah, the high-flow
2 months, May and June, it's -- when they get into those
3 much higher flow conditions, they're obviously a
4 small -- relatively small part of the year.

5 It's the other ten months of the year where flows
6 are lower where, you know, we are adding flow to a
7 low-flow condition and improving the general habitat
8 for the fish.

9 If -- if we get into, you know, crazy freshet
10 events, normally, the fish are going to find some
11 refuge where they hang out until those freshet flows
12 have declined to a more adequate level.

13 Q That works. Thank you, Mr. Bewley.

14 Let's move on to a slightly different -- oh, I
15 almost shut down my little guide to questions that I
16 have.

17 MR. O'GORMAN: Zoom Host, can you please take
18 us to Document 44, Appendix 3? What are we on right
19 now? Document 44 -- is this Document 44, Appendix 3?
20 It's late in the afternoon, so some of these -- so
21 let's look at page 246, same document. Right. Got it.
22 We see Table 3 here, comparison of some predicted
23 changes. Can we blow it up a little bit, please, Zoom
24 Host? Thank you.

25 Q MR. O'GORMAN: So now we see for some
26 different bio periods, different times of the year,

1 Gold Creek and Blairmore Creek, predicted changes in
2 water temperature compared to optimal temperature
3 ranges for each bioperiod are summarized; right?

4 A DR. BEWLEY: Yes. Correct.

5 Q Okay. Ten pages before this --

6 MR. O'GORMAN: So on page 236 of this
7 document, Zoom Host, please.

8 Q MR. O'GORMAN: So, yeah, on this page -- it
9 may be easier for you to find it on your own version of
10 it -- tell me if you agree that it's stated that
11 projected increases in temperature with flow changed
12 during egg incubation, plus .2 degrees Celsius for Gold
13 and .05 degrees Celsius for Blairmore, are negligible
14 relative to baseline water temperatures at this time.
15 So warmer than optimal ranges for egg incubation by 6
16 to 9 degrees. And so I will keep going, and I'll ask
17 you to confirm. It's in the middle of the fourth
18 paragraph that I'm reading from: (as read)

19 It is likely that relatively small predictive
20 increase in temperature will result in
21 incremental adverse effect on incubation,
22 like earlier emergence. And the predicted
23 decrease in temperature, negative .17 Celsius
24 for Gold and point -- negative .25 Celsius
25 for Blairmore, would only shift temperatures
26 toward the species preferred incubation

1 range.

2 So you agree you told us that?

3 A DR. BEWLEY: Can I just have 20 seconds to
4 discuss something, please?

5 Q Sure.

6 MR. O'GORMAN: Mr. Chair, while they're
7 checking something, remind me where we're at for time.
8 When did you want to take a break?

9 THE CHAIR: I would say anytime now would
10 be a good time. So if you're just about done this
11 section, fine. If not, we should probably still take a
12 break in the next little while.

13 MR. O'GORMAN: Okay. I'm not done this
14 section, but I realize I completely lost track of time.
15 So I will try and look for a chance for us to take a
16 break, but there will be questions after the break --

17 THE CHAIR: Okay.

18 MR. O'GORMAN: -- in the next, you know, 10
19 or 15 minutes.

20 Q MR. O'GORMAN: Sorry, Mr. Bewley. I ...

21 A DR. BEWLEY: All right. Thanks. Thanks
22 for waiting.

23 Yes, generally that's what we agree. Mr. Bettles
24 is more familiar with the biology.

25 I just want to point out that the whole -- you
26 know, we've -- we've talked about differences in flow

1 conditions. Further up in the document, all this --
2 this temperature modelling that you see here is all
3 based on, if you have a change in flow, how does that
4 translate into change in the stream hydraulics that may
5 control temperature? So one example is, obviously, if
6 you reduce flow, you maybe reduce stream depth, and
7 that may potentially warm things up.

8 The -- the flows -- the change in the flows and
9 the hydraulics are very small. You can go and see the
10 hydraulic changes with flow further up the document.
11 And that's essentially what transcends down into this
12 modelling that you see here in these -- these values.

13 Q Okay. Well, really, what I want to talk about is --
14 and I'm not sure if I pronounce this word properly --
15 hyporheic?

16 A Hyporheic.

17 Q I call it "hyporheic", my fisheries friend called it
18 "hyporheic". So --

19 A Hyporheic.

20 Q So whichever way, you know the word that I'm talking
21 about and that type of flow, the flow through
22 subsurface sediment and porous space that's adjacent to
23 a stream.

24 And so we're wondering about the potential for
25 decreases in flow that are predicted for Gold Creek to
26 lead to reduced hyporheic flow and the potential

1 implications of that, including, for example, if you
2 did have that happening, would you have an increase in
3 deeper groundwater, which would contain less dissolved
4 oxygen into the spawning beds? So I'm going to ask you
5 what you think about -- first of all, can you explain
6 what you -- your understanding about hyporheic flows
7 and their importance to the successful spawning of
8 westslope cutthroat trout?

9 A I just talked to some of the hyporheic details, and
10 then maybe Mr. Bettles will take over with the biology
11 side of it.

12 If flows drop in Gold Creek, what you may find is
13 the hyporheic flows increase. And by that I mean you
14 will lose potentially more water from the surface
15 channel that the fish care about into the gravels. And
16 Mr. Houston has talked earlier this week about the
17 reaches that we do see some flow loss through into
18 the -- the gravel beds, and that's -- that feeds into
19 some of the -- the engineering that we've had this week
20 where -- and I've talked about it myself -- we think
21 there's issues with debris falling into the channel,
22 and sediment builds up behind it, which means that the
23 water is now going through the sediment, where before
24 the blockage it was above the channel bed. So that --
25 that issue feeds into some of the plans that we do have
26 as part of the offsetting plan.

1 Just in terms of biology, Mr. Bettles, do you have
2 anything to add?

3 A MR. BETTLES: Good afternoon, Mr. O'Gorman.

4 Q Good afternoon.

5 A Good afternoon.

6 Just to add to Dr. Bewley's component, just for
7 some context around Gold Creek, Gold Creek is generally
8 a fairly stable system when it comes to stream
9 temperature. You know, obviously, you mentioned
10 Caudron Creek is a very important contributor to -- to
11 Gold Creek from the confluence from Caudron. But even
12 upstream of that, even with lower flows, we're seeing a
13 fairly consistent temperature regime, and I would think
14 that given the modest sort of predictions of -- in
15 terms of changes in flow that we're seeing, we're not
16 a -- I mean, I wouldn't anticipate -- just from
17 experience, that we wouldn't anticipate to see a
18 substantive change in terms of stream temperature that
19 would -- that would result in any sort of adverse
20 effects.

21 Q Okay. But the paragraph that you describe in here
22 isn't so much focused about potential impacted
23 temperature but of lower dissolved oxygen; right? And
24 what -- that's what I'm asking, really.

25 A Oh, right, right. So with dissolved oxygen, yes, as
26 temperature decreases, obviously -- or as temperature

1 decreases, dissolved oxygen goes down as well. But I
2 would -- I would argue that -- I can't speak to the
3 depth of groundwater and where that gets -- comes into
4 play on this. I think Dr. Bewley touched on that.

5 But given the -- if there's a slight shift in
6 temperature, even if it slightly went up, you'd
7 probably get -- most likely get a bit more of a -- more
8 oxygen, dissolved oxygen, but I can't speak to the --
9 the actual -- what's actually happening to that in
10 terms of -- but, again, what I can say is that the
11 temperatures are generally fairly stable through the
12 system. So even with any sort of shift, I don't -- I
13 can't anticipate -- I don't anticipate dissolved oxygen
14 will shift all that -- that much that would cause a
15 problem.

16 Q So if I were to summarize, because I'm not sure I
17 really heard it in there: If the project -- if the
18 project impacts hyporheic flows near Gold Creek, what
19 sorts of impacts might it have on westslope cutthroat
20 trout?

21 A Well, it's -- I think if there's a shift in hyporheic
22 flows, it's hard to say. I mean, the spawning -- if
23 you're worried about spawning and incubation, I mean,
24 the cutthroat actually -- they're fairly dynamic in
25 their spawning. They don't always hit the same
26 location. They move around a fair -- you know, from

1 year to year, from our experiences of monitoring in
2 Gold Creek and -- and even Blairmore Creek, for that
3 matter. So if there's a shift in hyporheic flow, I
4 think that would depend on the -- on the location in
5 terms of what -- where that would occur.

6 But generally where we're seeing spawning, from
7 our surveys of where we think spawning is occurring, I
8 believe we've observed spawning and pairing of a
9 fish -- to be occurring in large numbers of fish kind
10 of congregating in spawn -- for spawning during
11 spawning window, that we wouldn't expect the change
12 to -- any particular change to the hyporheic flows that
13 would influence the spawning success.

14 Q Do you think there will be changes in the hyporheic
15 flows, just --

16 A I can't say for sure off -- off the top of my head. I
17 mean, our -- our instream flow assessment looks at
18 total flow in the system, and it takes the total
19 flow -- the surface flow and the -- and any sort of
20 hyporheic or groundwater flow.

21 So maybe Dr. Bewley can speak to that sort of
22 interaction in a little more -- in more detail than I
23 can.

24 A DR. BEWLEY: I mean, Mr. O'Gorman, this
25 feeds into, you know, discussions around monitoring --
26 continued monitoring and adaptive management down the

1 line.

2 We -- I should add that this, like every other
3 document that we've produced -- this was produced back
4 in 2016. We -- we now have seven stream gauges on Gold
5 Creek, which I believe is one of the densest
6 hydrometric networks anywhere in Alberta. It's seven
7 stations in the space of 20 kilometres. That's one
8 every 3 kilometres to monitor for what those flows are
9 under different flow conditions. And that ties into,
10 you know, reruns of the IFA calculations at some point,
11 but also it sets the baseline for continued monitoring
12 as those projects -- as the project residual impacts
13 occur through time.

14 So we'll build heavily through our monitoring
15 program that continues to evolve and -- and use that as
16 a good reference.

17 Q Okay. In the page we were looking at, it was -- and I
18 recognize, Mr. Bewley, this was produced in 2016. I
19 mean, at the time, in 2016, in here, you suggest that
20 there's the potential for the reduced flows, and I
21 think there's a "could" -- could lead to lower
22 hyporheic flow, and there's a potential for that to
23 lead to impacts on the SWCT, particularly spawning and
24 eggs. And I'm asking you if you think that's going to
25 happen because you told us there you -- you know, it's
26 a possible outcome, and you do tell us that flows are

1 going to be potentially reduced.

2 So I guess I just really want to know whether --
3 the potential of this happening, what's your sense of
4 the likelihood of it? If it -- you know, you indicated
5 it's certainly a possibility here. And if so, you
6 know, the impacts that we might see on the trout,
7 because I don't think I really heard that.

8 A MR. BETTLES: Mr. O'Gorman, it's
9 Cory Bettles again.

10 I'll try to answer. I -- I think the risk -- I
11 think the risk is low. I think we're talking about
12 small predicted changes. Of course, I mean, we've --
13 we've modelled, obviously, different scenarios,
14 sensitivities, and, obviously, as you move up into a
15 different -- the higher, more riskier scenarios, you do
16 get, you know, slightly increased changes. But I -- I
17 would -- I would say that -- that, generally, I think
18 the -- I would believe the risk is -- is low to changes
19 to hyporheic flow. I mean, there's -- again, the
20 changes that are predicted are not -- are not high, and
21 I would -- I would think that, you know, there's ways
22 that I think we might be able to -- to track that.

23 But, again, I said before, the -- the fish don't
24 always spawn in the same location, and they -- they do
25 shift around. And so it's -- it's something that we
26 are monitoring. But I think ultimately, to your point,

1 the question you're trying to get an answer to is that
2 I -- in my opinion, the risk is -- is fairly low.

3 Q Okay. You did talk about monitoring, so fair enough.

4 MR. O'GORMAN: Mr. Chair, I'm going to
5 suggest I'm -- I have made good progress through my
6 fish questions. I do have more. Maybe it would be a
7 good chance for a ten-minute break.

8 THE CHAIR: Sure. It's just about 3:40,
9 so let's break until 3:50.

10 MR. O'GORMAN: Thank you.

11 (ADJOURNMENT)

12 THE CHAIR: Okay. Go ahead, Mr. O'Gorman.

13 MR. O'GORMAN: Okay. Thank you, Mr. Chair.

14 Q MR. O'GORMAN: Okay. I -- in the interest of
15 time, I might try and avoid hauling up references as
16 much as I can through this next bit and ask if you just
17 agree with some of the things that you've said.

18 So I think you'd say that you've confirmed in
19 multiple places in the EIA that you expect the project
20 will result in the reduction of groundwater discharge
21 to Blair and Goldmore [sic] Creeks; right?

22 A MR. HOUSTON: That's correct.

23 Q And as stream temperatures during winter already reach
24 near freezing temperatures, reducing groundwater
25 discharge in the winter months will reduce temperature
26 regulation provided by the groundwater -- groundwater

1 inputs and then potentially increase the likelihood of
2 increased freezing in overwintering habitats. Do you
3 agree with that?

4 A One minute, Mr. O'Gorman.

5 We would say, Mr. O'Gorman, that there are
6 offsetting effects. If we look at Blairmore Creek, for
7 example, we're talking about discharging treated water
8 into Blairmore Creek year round, and that water would
9 have been in the SBZ, which is essentially groundwater
10 conditions from a temperature point of view.

11 So we -- we would think that, especially in
12 Blairmore, that there -- there would not be an effect
13 of cooling, that there would be enough discharge of
14 water -- treated water that you wouldn't see that
15 effect.

16 With regard to Gold Creek, you know, I -- I guess
17 there may be a modest effect on the upstream reaches,
18 although the impact on groundwater in those reaches
19 is -- is fairly small. And then once you get south of
20 Caudron Creek, it's really -- Caudron Creek maintains
21 the temperature of the -- of Gold Creek, so it's very
22 much regulated by that strong influx from -- from
23 Caudron.

24 Q Do you agree, though, there would be impacts? Like,
25 you know, whatever the scale of that impact is, that
26 you are going to be reducing some overwintering habitat

1 by some of the changes in temperature from reducing the
2 groundwater inputs? Whether that's a large or a small
3 impact is a different question, but ...

4 A I think possibly a small impact on the reaches of Gold
5 Creek, but outside of that, no, I -- there shouldn't be
6 an impact.

7 Q Individual overwintering pools, for example, might be
8 impacted?

9 A I'll get Mr. Bettles just to respond to that.

10 A MR. BETTLES: Thanks for the question,
11 Mr. O'Gorman.

12 As we've, I think, highlighted through a few of
13 the submission documents that we have, is that, you
14 know, high-quality deep pool habitat is -- is obviously
15 living in the system. But in those deep pool habitats,
16 there's -- there's obviously a lot of open flow through
17 there, and I would -- I would say that through our
18 instream flow assessment that we conducted, our -- it
19 showed that there was a very, very -- quite a small
20 shift -- a small change in habitat suitability for
21 those -- for that overwintering habitat in those areas.
22 So I'd leave it at that, I think.

23 Q Is this -- thank you, Mr. Bettles. Is this something
24 you're going to be monitoring? And specifically these
25 potential impacts on small-scale overwintering habitats
26 in pools from temperature change?

1 A There's been a lot of work done over the last few years
2 by some research done by the University of Lethbridge
3 that has -- has been very -- you know, has provided
4 some good information. And, you know, given also the
5 fragmentation disconnectivity that we've shown, even if
6 you have good -- good-quality habitat in areas, if the
7 fish can't get to it, that poses a problem.

8 So I think through the proposed offsetting that
9 we've looked at, there are going to be opportunities
10 to -- to do some monitoring, but that is obviously
11 something that Benga needs to -- meet to that.

12 Q So my question was about monitoring of overwintering
13 pools, impact from temperature change from reduced
14 groundwater -- impact from reduced groundwater, and
15 I -- did you -- how did you respond to that? Is that
16 something you are or are not going to do?

17 A MR. HOUSTON: So let me maybe summarize: We
18 are monitoring temperatures at the hydrometric stations
19 that Mr. Bewley has mentioned, and so that's -- that's
20 fairly dense. We will be monitoring the -- the
21 overwintering habitat that we create, and the existing
22 overwintering habitat is part of the offsetting plan.
23 So both of those things will be monitored.

24 With respect to monitoring water temperature
25 specifically in the overwintering habitat, I -- I'm --
26 I don't believe we've agreed to that, and I'm not sure

1 whether it would be instructive. I -- I don't know if
2 the temperature difference would be something that
3 would be, you know, significant to -- to monitor.

4 Q Okay. Thank you, Mr. Houston. Let's move on.

5 Let's talk about calcite, which was talked about
6 earlier, and the potential for calcite formation. So
7 without hauling up the reference again, if I can, would
8 you agree that back in your original Consultant
9 Report 6, you did identify that the baseline water
10 chemistry in Gold and Blairmore Creeks had a calcite
11 saturation index of 0.6, I believe, which would mean it
12 would have the capacity for calcite to precipitate?
13 But you did -- and I think -- first of all, does that
14 sound right? We can haul up the reference if we need
15 to but ...

16 This was -- okay. Well, maybe we should. This
17 was something you told us in Registry Document 44,
18 Consultant Report 6, PDF page 61.

19 A MR. BETTLES: Sorry. Can you just repeat
20 the question just one more time, Mr. O'Gorman?

21 Q Okay. Well, I was actually trying to establish: Did
22 you tell -- did you tell us there that the creeks had a
23 calcite saturation index of .6, so had the potential,
24 at least, for calcite to precipitate?

25 A We did say that in the -- in our assessment, yes;
26 you're correct.

1 Q Right. And you went on to talk about the natural
2 waters appearing to have no capacity to prevent it, so
3 it was something that would need to be considered;
4 right?

5 A Yes, that's correct.

6 Q Thank you.

7 So we talked about this earlier when we were
8 talking about hardness, obviously. Tell us,
9 Mr. Bettles, if -- tell us why we'd be concerned about
10 calcite precipitation on the substrate in Gold and
11 Blairmore Creek. What's the impact of that?

12 A The issues that raise with -- with calcite
13 precipitation is, obviously, in filling of -- of
14 interstitial spaces and -- and around spawning habitat,
15 which would prevent fish from spawning and also
16 would -- would potentially implicate productivity at
17 lower trophic levels.

18 Q Once it starts to happen, is it easily reversible?

19 A I'm not a -- a chemist to be able to speak to the
20 treatment of that. I -- I can't speak to if there's a
21 treatment that can be applied after it's occurred in
22 the -- in the creek itself.

23 But I might maybe defer this over to Mr. Jensen to
24 speak to how you would treat the source of the
25 potential. I think that would be the -- the risk
26 component of it.

1 Q Mr. Jensen, you can speak to that, but I -- I mean, I'm
2 not -- I'm very specifically saying: Once calcite has
3 started to deposit on the base of those, but is it easy
4 to then reverse that?

5 A To my knowledge -- I can't say for certain, but I -- I
6 don't believe it's -- it's reversible once it's in.
7 But, again, I'm not -- it's not in my area of
8 expertise.

9 Q Anyone else?

10 A MR. HOUSTON: So --

11 Q Mr. Jensen, maybe, or --

12 A Yeah. So either Mr. Jensen or possibly Mr. Day could
13 speak to calcite.

14 And I think we all agree, Mr. O'Gorman, that
15 monitoring and early detection of tendency to form
16 calcite is something that, again, we've -- we've agreed
17 to do as part of our aquatics management plan. And
18 then if we did see that occurring or beginning to
19 occur, I think we'd want to look at some -- some
20 chemistry to avoid or to mitigate or -- avoid,
21 actually, formation of cal -- calcite.

22 So I think, Mr. Day, can you talk a little bit
23 about that?

24 A MR. DAY: Yeah.

25 Mr. O'Gorman, I think there's a number of us that
26 can contribute to this discussion. I'll say what my

1 kind of knowledge of this is. I'm sure Mr. Jensen will
2 have comments, and -- and others might too.

3 The -- there has been research done in the
4 Elk Valley on the use of antiscalants to -- to prevent
5 calcite from precipitating directly in the -- in the
6 creeks, and there's also been work done on thinking
7 about how to -- how to use that to kind of de -- to
8 sort of descale, if you want, as well. So that's --
9 that's a possibility.

10 Q Okay. Not seeing anyone else jump in.

11 MR. O'GORMAN: Can we please -- Zoom Host,
12 this time I will haul something up on the screen.
13 Let's look at Registry Document 69 and PDF 117. This
14 was an early S -- IR response. So Registry Document
15 69. If we scan out. Right.

16 Q MR. O'GORMAN: Or, actually, do I -- well,
17 actually, on this, in the response to the information
18 request, you did state down at the bottom -- would you
19 agree -- that: (as read)

20 The predicted calcium carbonate hardness in
21 Blairmore Creek downstream of the project
22 during operations and closure will increase
23 from a maximum background of 225 milligrams
24 per litre to 367 or 471 milligrams per litre,
25 depending on the mine phase and nodes.

26 Is that right?

1 A MR. DAVIES: Mr. O'Gorman, it's Martin
2 Davies.

3 I can agree to that, yes, I think from a --

4 Q Great. Thank you.

5 So now I want to look at page 107, please. So are
6 we seeing -- so you've told us the current background
7 conditions are susceptible to calcite formation,
8 although, admittedly, you said you didn't see any. You
9 told us that the operation of the mine is predicted to
10 increase hardness downstream of the project. And in
11 this response -- in the response on this page, you
12 indicate that the potential for calcite formation -- I
13 won't -- you can read it on your own, probably, rather
14 than trying -- us looking at it on the screen together,
15 but I -- I would interpret you as saying that the
16 potential for calcite formation to impact fish and fish
17 habitat was considered low. And I guess I'm curious if
18 you can explain that a little bit more. Why did you
19 consider it to be low, given those other two things I
20 just said?

21 A MR. BETTLES: Mr. O'Gorman, I'm not sure if
22 we're on the right page. Maybe I'm -- maybe we're --

23 Q Are we on the right page? Let me check here, see if we
24 can --

25 A MR. HOUSTON: Page 109, Mr. O'Gorman.

26 Q So I apologize.

1 Do you see it on there, where you said that in
2 your response?

3 A MR. BETTLES: So, Mr. O'Gorman, the
4 rationale for stating that we feel that the risk to
5 calcite precipitation or formation on fish and fish
6 habitat would be low is -- comes from the treatment --
7 water treatment and going through and contact water
8 being captured through the water management processes.

9 And, again, I can't speak to the type of treatment
10 that would be required to do it, but based on the
11 treatment of that would ensure that the water -- any
12 water would -- that would go into either Blairmore or
13 Gold Creek would -- would not -- would be per -- would
14 be treated and mitigated enough that when it was
15 released, that it wouldn't prevent -- or prevent
16 calcite precipitation.

17 Q Okay. I'm not sure I understand that, because
18 you're -- are you projecting that the hardness goes up
19 and there's more calcium carbonate and calcite to be
20 precipitated?

21 A I'll -- I may have to push that over to -- to our
22 geochemists or to the water management team on that.
23 It might be a trigger that we need to talk about on
24 that specifically.

25 A MR. DAY: I can -- I can take a shot at
26 that, and then others can -- can try to help.

1 I mean, like, this is not something that will show
2 up immediately. It's -- again, it's another one of
3 those things that early on you can -- you can monitor
4 and check mechanical indicators to show that you've got
5 your -- got the calcite saturation index going up.
6 And -- and it definitely wouldn't just spread
7 downstream. You'd see it kind of forming near source,
8 and you could -- you could pick it up with visual
9 monitoring as well. So there's lots of opportunities
10 to -- to catch it early on.

11 Q Okay. Tell us, someone, if it starts to happen, what's
12 the impact on westslope cutthroat trout and their
13 habitat -- mostly on their habitat, I guess? What
14 happens? Describe it for us.

15 A MR. HOUSTON: So, Mr. O'Gorman, we think
16 that the potential for calcite deposit is -- is
17 primarily in Blairmore Creek because of the -- the
18 contact water and the treatment for the contact water;
19 that Gold Creek, in this respect, will basically stay
20 in its current state, that there will be no changes in
21 Gold Creek.

22 And so --

23 Q Okay.

24 A In Blairmore Creek, obviously, the deposit of calcite
25 is -- is not something we want to happen, and we've
26 included, you know, monitoring for calcite as part of

1 our aquatics monitoring program.

2 If -- if it should occur, I mean, one of the --
3 the good features of this project is that the -- the
4 water's being gathered and controlled in one water
5 management system so that addition of calcium treatment
6 can be implemented, if necessary.

7 And I think I'm going to ask Mr. Jensen to talk a
8 little bit about, you know, what kind of treatment that
9 would look like.

10 A MR. JENSEN: Yeah. So treatment for
11 calcite's relatively straightforward. It comes down to
12 relieving the -- the calcite supersaturation, and
13 there's two processes. One is offgassing any CO2
14 that's contained in the water, and at the same time,
15 you need to have a nucleation material, so other
16 calcite that the calcite can precipitate onto.

17 So it -- I mean, it's something that can be put
18 in, for example, to those -- the ponds that we showed
19 or that we discussed earlier that were shown on the
20 map. It's -- it's relatively straightforward. Even a
21 little bit of addition of acid or -- or certainly lime
22 treatment would -- would relieve the supersaturation.
23 So it's -- it's relatively straightforward and can be
24 done in relatively short order when -- you know, as
25 long as the water is in hand, which it is.

26 Q So are you saying you're going to do that from the

1 beginning, or is that an adaptive management response
2 you will adopt at some point, based on monitoring?

3 A MR. HOUSTON: So we're going to monitor, and
4 that is a response that we would -- we would apply
5 if -- if there was either calcite forming or -- or a
6 strong possibility that it could form.

7 I should remind you, Mr. O'Gorman, that we will be
8 monitoring the -- the chemistry of the water as it's
9 leaving, so we'll -- we'll be -- as part of our water
10 chemistry monitoring be -- be also looking at the --
11 this issue, so -- even before we see calcite
12 precipitation in the stream. But it would also be a
13 part of our monitoring program of -- of the stream
14 beds.

15 MR. O'GORMAN: Okay. Could we look at, Zoom
16 Host, Registry Document 542, which was a submission
17 from DFO, and PDF -- so it's 542. I hope that I gave
18 you this in advance, and it's possible I did not.
19 Right. And PDF 279.

20 Q MR. O'GORMAN: And there's a
21 Recommendation 19 that we see right there. I will
22 allow you to read it. It related to --

23 MR. O'GORMAN: Go back up, Zoom -- up a bit
24 again, please, Zoom Host. Thank you.

25 Q MR. O'GORMAN: I would assume that you folks
26 have read this before. We're curious whether you're

1 committing to adopting this Recommendation 19 from DFO
2 about implementing a quantitative assessment of the
3 potential for calcite precipitation and its effects on
4 the trout and their habitat and suitability. I'm not
5 sure whether -- you've considered whether you are
6 committing to adopting that or not before.

7 A MR. HOUSTON: Yeah. One minute,
8 Mr. O'Gorman.

9 So, Mr. O'Gorman, again, as I mentioned, we've
10 been monitoring Gold Creek for four years doing the
11 snorkel surveys, and, you know, there -- there doesn't
12 appear to be a calcite precipitation problem in that
13 creek, and we don't anticipate that anything we're
14 doing would -- would lead to that.

15 With respect to Blairmore Creek, I think what --
16 what I have indicated before would stand, that we -- we
17 will be monitoring the chemistry of the water. We will
18 be monitoring the creek beds. And -- and should a
19 calcite issue or the potential -- strong potential for
20 calcite precipitation develop, as Mr. Jensen mentioned,
21 the -- the treatment for calcite is -- is fairly
22 straightforward and fairly quick to implement in the
23 ponds that we have existing.

24 So I'm not sure what it means. (as read)

25 A quantitative assessment of the potential
26 for calcite precipitation and its effects on

1 westslope cutthroat trout habitat should be
2 completed.

3 That seems to apply to Gold Creek. And so I think we
4 would need to discuss this further with DFO to
5 understand exactly what they're -- they're looking for
6 here.

7 Q Well, I didn't produce their -- their question and
8 recommendation, obviously, so I can't speak to that,
9 either. We thought it was interesting to see how you
10 would react to it. But I'll move on from there.

11 A Okay.

12 Q You know, most -- so I think sort of -- about at the
13 end of this thread, if I could summarize, you are
14 saying you're putting a lot of emphasis on monitoring
15 and treatment up-front, and yet you produced results
16 that show this increasing hardness. And -- and I think
17 you would agree that if the calcite precipitation
18 starts to happen, you effectively can't unconcretize
19 the stream bed, can you? It's not -- it's not a highly
20 reversible effect; right?

21 A That -- that's -- that's correct, Mr. O'Gorman. It's
22 not easy to reverse.

23 Q Okay. Okay. Let's carry on.

24 Although -- just one second. Sorry. Okay. We're
25 good. Yeah.

26 My next question is -- it's about -- sorry,

1 gentlemen, it's late in the day, and I'm starting to
2 fade.

3 Okay. I wonder if you can tell me -- right. So
4 there was a discussion about this that took place
5 earlier this week, I will remind you, about the
6 monitoring of the declines in populations in Gold
7 Creek -- arguable declines, the numbers. We had quite
8 a bit of dialogue about that, as you'll recall, and I
9 wonder if you can -- in both creeks. Sorry.

10 Remind us your views on -- 'cause I'm not sure it
11 was entirely clear to follow that whole conversation.
12 So tell us your view about the potential causes of
13 observed population declines in both of the creeks in
14 westslope cutthroat trout.

15 A So, first of all, Mr. O'Gorman, I think we all agree
16 that it's difficult to count the fish and -- and get a
17 perfectly accurate view of what the population is from
18 year to year. It's a -- it's an estimate at best, and
19 so what we've tried to portray in the information that
20 we've put before the Panel is that we have done
21 estimates year over year, and whether statistically
22 significant or -- or defensible from a statistics point
23 of view, what we do feel we're seeing in Gold Creek and
24 in Blairmore Creek is a reduction of population, so --
25 and primarily from 2016 to subsequent years.

26 I'll let Mr. Bettles talk about -- and keep in

1 mind that we don't have a, you know, science to -- to
2 support reasons for that reduction, so take what we're
3 going to say as some hypothesis that -- that could be
4 applied.

5 A MR. BETTLES: Thanks, Mr. Houston.

6 I would agree with that. Like, there's -- there
7 are some hypothesis that we -- that are out there in
8 terms of what we think may be -- may have occurred,
9 but, I mean, it's -- there's certainly no definitive
10 answer to that. What we -- what we do know from the
11 data we've collected post-2016 is there was a decline.
12 We -- we observed it in both Gold Creek and Blairmore
13 Creek. So it wasn't -- wasn't site-specific or
14 watercourse specific, though the numbers were obviously
15 much lower in Gold Creek than they were in Blairmore
16 Creek.

17 What we've been seeing since then through our
18 snorkel survey work and we've -- as I've said in
19 previous dialogue, that snorkel surveys have been the
20 primary monitoring of the populations to this point,
21 because when we started seeing the decline in 2017, we
22 needed to confirm if the numbers that we were seeing
23 were because of an actual decline or perhaps, like in
24 Gold Creek, as we've said about fragmentation, that
25 maybe the fish were just caught in different areas that
26 we hadn't been looking at in 2016. So that's why

1 there's been this kind of evolution or adaptiveness to
2 our program.

3 So to say why, there's a lot of factors that maybe
4 could have played into it, but I'm -- I'm certainly not
5 one to say exactly. These systems, I think, both have
6 their own existing stressors that are in the systems
7 and -- sorry, one second, please.

8 There's existing stressors, in particular Gold
9 Creek, and I think they -- they seem to maybe be
10 playing a role in sort of why the trout declines have
11 been observed. They're much more -- the stressors are
12 much more pronounced and evident in Gold Creek as they
13 are in Blairmore Creek, but that's kind of why we -- we
14 feel that doing some -- some work to try and fix those
15 problems will actually be of benefit to them.

16 I'm not sure if that entirely gets to your
17 question, Mr. O'Gorman.

18 Q No. That's fine.

19 So I'll put it to you: Do you feel that any of
20 the works conducted by Benga in that time period had
21 anything to do with potential observe -- observed fish
22 declines?

23 A MR. HOUSTON: No. We don't see how anything
24 we've done could have contributed to that.

25 Q And any releases that we might have heard about on the
26 record in 2015-ish time period, would that have had a

1 potential contribution?

2 A The -- the releases that you may have heard of, the
3 ones that were reported through the AER and
4 investigated, occurred -- I believe they were in 2015.

5 Am I right on that? 2015. So, you know, we would
6 have expected, if that was the cause, to see some
7 effect in 2016 surveys.

8 Q So I guess I would say that the Panel, we've -- you
9 know, in listening to some of the conversation and
10 reading the submissions we've seen about concerns of
11 potential impacts to westslope cutthroat trout that
12 might occur as a result of the project and then looking
13 at the mitigation and offsetting potential that Benga's
14 proposed to address residual impacts, and given some
15 concerns that we've been exposed to this week around
16 the population counts of westslope cutthroat trout,
17 whatever the cause of them, I guess we're curious, and
18 I'm looking for a professional opinion.

19 So, Mr. Bettles, I think I'll tag you. In your
20 professional opinion, is the current population in Gold
21 Creek and Blairmore Creek, for that matter, resilient
22 enough to endure a failure of any of the, you know,
23 water management and habitat management mitigation
24 measures that Benga has proposed to avoid becoming
25 extirpated?

26 A MR. BETTLES: So you're looking for my

1 professional opinion on this? Let me start with -- let
2 me start with Blairmore Creek. I think that one is a
3 little -- slightly different.

4 The two systems are very different, and I can't --
5 I'll make that clear, first -- first and foremost. I
6 mean, Blairmore is, as you know, above the -- the known
7 barrier. You've got some hybridization that's
8 occurred, albeit, from my knowledge, from the last time
9 I've seen genetic data, that the hybridization
10 numbers -- numbers are quite low, or the amount is
11 fairly low, but it's still a hybrid population. It is
12 more of a traditional trout system.

13 What we're seeing, that they're -- the numbers of
14 fish that have been coming back quite -- quite -- quite
15 aggressively the numbers are coming in. So I would say
16 that that system is certainly reasonably resilient,
17 from what we can tell so far, since we initially
18 observed the decline and what we've been seeing up to
19 this -- most recently last summer and -- and late fall
20 period.

21 It certainly doesn't experience, from our
22 perspective, the same existing stressors that are in
23 there compared to Gold Creek, so I think Blairmore
24 Creek is certainly a -- a fairly resilient stock in
25 that system.

26 With respect to Gold Creek, there's -- there's a

1 lot of different things going on in that system that
2 seem to -- currently, under existing conditions, seem
3 to pose some potential challenges for the -- for the
4 population. I think it's been well noted through some
5 of the work we've done but also through the Benson 2019
6 thesis, which you've got a lot of -- a fair bit of
7 disconnectivity fragmentation that is really, in my
8 opinion -- and I think the literature -- the scientific
9 literature points to this quite a bit as well, that
10 it -- that it is a very -- it causes problems to --
11 to -- to populations of fish and that that -- that is
12 certainly, I think, a pretty important aspect of why
13 the population seems to be struggling there too.

14 I would also like to say that the temperature
15 regime in Gold Creek, I think, itself, I think, is --
16 it's a much more stable system, but the temperatures
17 are much lower, which does play a role in productivity
18 in the system itself. But with -- and there's -- and
19 there's other -- a lot of other stressors that are
20 going on in that system that I think, compounding right
21 now, are causing additional stresses to that stock in
22 itself.

23 Having said that, you know, I think what we've
24 noted, there's some things that could be -- could be
25 fixed on that system that could improve the resilience
26 of the population that's in there, and I think we've

1 highlighted that in our offset plan.

2 And one thing that's not in our offset plan is the
3 additional fragmentation that we've observed higher up
4 in the -- in the system where you have complete
5 disconnectivity, even as of this last summer, where
6 we -- and we know there's fish above this -- this
7 disconnected area, and the fish can't move, and the --
8 the flows -- unless the flows come up but are --
9 whatnot, then they're going to be stuck there, and they
10 just can't move around to the better habitats that are
11 available to them.

12 So I think in the event of, you know, nothing gets
13 done to this, that that -- that population will be
14 struggling regardless, and I think Benga's proposal to
15 try and fix some of these things would be of benefit to
16 the population in Gold Creek.

17 Q Okay. Okay. Thank you, Mr. Bettles. I appreciate
18 that.

19 Two last questions, one short, one maybe a little
20 bit longer, on fish to wrap up the fish questions.

21 I think this will be a fairly simple one:
22 Mr. Houston, can you -- so we don't need to haul it up.
23 I'm sure you're aware that in their hearing submission,
24 DFO went through an assessment of your project and
25 indicated -- and I don't have their exact words written
26 down, but in general I think you'd agree that they

1 characterized that it -- they would have -- I think
2 they used the word "unlikely" to be able to issue you a
3 SARA permit that you would need for this project to
4 proceed because of potential concerns about impacts to
5 critical habitat in Gold Creek. Is that your -- is
6 that a fair way to characterize what they've said?

7 A MR. HOUSTON: I mean, those are the words
8 that I read in their submission as well, Mr. O'Gorman.
9 And I have to say, it surprised us a little bit because
10 we had been working with DFO since early in the project
11 to -- to understand what -- especially the offsetting,
12 what measures, mitigations, what offsetting approach,
13 and what design requirements needed to be built into
14 the project to make this an acceptable project.

15 So we've been working -- and I believe that
16 information's all on the record, that we've been
17 working quite extensively with DFO for some time.

18 So those words were a little bit disconcerting to
19 me, and I -- I guess we all would like to believe that
20 there's, you know, a -- we know that there's additional
21 work that needs to be done to make the -- the
22 offsetting plan certifiable or -- or to make it to a
23 stage that it's ready to be approved. And that's work
24 that we've always understood needed to be done, once
25 this process is over, to, you know, do the engineering
26 on those offsets and get a very, very specific plan

1 and -- and, indeed, to also work on the monitoring
2 program that goes with it.

3 So we understood all that work needs to be done,
4 and -- and we're looking forward to getting back to
5 that work with DFO and -- and, you know, putting
6 forward a -- a final plan that is -- is approvable.

7 Q Okay. And I just want to really -- that was the
8 lead-in to me wanting to clarify that we have a common
9 understanding.

10 So you understand, correct, Mr. Houston -- Benga
11 understands that the decision of this Panel, whatever
12 it is, say, were we to decide under the Coal
13 Conservation Act that the budget was in the public
14 interest and to make a recommendation to the federal
15 minister under Canadian Environmental Assessment Act,
16 2012, that we think, thumbs-up, the project should
17 proceed, that that's not binding on DFO and their
18 decision-making under SARA; correct?

19 A We -- we understand it's a separate approval that --
20 yeah. We understand they have the authority to approve
21 or not our -- our application.

22 Q Okay. All right. Thanks. So thank you, Mr. Houston.

23 This one is for you, because it's a big overall
24 wrap-up question, and those are your -- those are your
25 bailiwick, as I understand.

26 So if I think about the whole range of sorts of

1 water and aquatic habitat issues that we've heard about
2 this week and through four years of regulatory process,
3 we've got some uncertainties about potential impacts at
4 levels of selenium and what their impacts may be along
5 with -- that's been discussed a lot. We've got some
6 uncertainties around potential for sulphate toxicity,
7 predicted concentrations. Some of the modelling used
8 all this reaching in excess of a thousand milligrams
9 per litre. We've got some exceedances of water quality
10 guidelines for some other items, which we haven't even
11 talked about today, but I'm actually going to come back
12 to in my real, final wrap-up question for this panel.
13 So maybe this is a bit out of order. My apologies.
14 Again, it's late in the day.

15 We've got, you know, concerns about potential
16 shift, maybe, in the phosphorous concentrations in
17 Blairmore Creek that might shift the trophic status of
18 that creek; that was raised in some of the hearing
19 materials. We haven't talked about it in this part of
20 the hearing so far, but it's been said.

21 There's potential for calcite deposition, you
22 know, if -- in light of predicted hard -- increases in
23 hardness.

24 I guess we're curious about whether you conducted,
25 from your perspective, a real, thorough cumulative
26 effects assessment of all of these issues on westslope

1 cutthroat trout and how, looking at all these
2 uncertainties, we can have confidence as a Panel about
3 what the possible impacts to the trout and their
4 habitat are going to be?

5 A So the -- the critical habitat that has been identified
6 is in Gold Creek. I understand -- and we'll talk about
7 Blairmore Creek after that. So we have designed this
8 project to have as small an impact on Gold Creek as
9 possible. That means setbacks. That means not putting
10 treated contact water into Gold Creek. There --
11 there's a lot of work that's gone into respect the
12 nature of that habitat.

13 We have done it -- done extensive evaluation work
14 of the westslope cutthroat trout in Gold Creek and
15 especially the work that Mr. Bettles and his team
16 have -- have done to understand the fish populations,
17 the geomorphology, and -- and to understand the
18 shortcomings of that critical habitat.

19 So I think from -- from where we sit, the
20 westslope cutthroat trout in Gold Creek are going to
21 benefit from this project, benefit in the
22 implementation of the offsetting plan, cleaning up
23 the -- or getting the creek back into the -- the
24 original creek bed, adding some overwintering habitat,
25 replacing the riparian habitat that we -- we will have
26 to take out as a part of the -- the mining project.

1 But more importantly, they're going to benefit
2 from having a company responsible for monitoring all of
3 that work and -- and, if necessary, maintaining it or
4 taking corrective action through a period that's going
5 to last, you know, 30, 40 years, right through to the
6 reclamation stage.

7 So I think that that is an advantage that, you
8 know, many other populations of westslope cutthroat
9 trout won't have. They're -- they're not being
10 monitored regularly like that. They don't have a
11 company that's managing them on a year-over-year,
12 month-over-month basis. So I think there are a lot of
13 benefits that this project brings to the westslope
14 cutthroat trout population in Gold Creek.

15 With respect to Blairmore Creek, the habitat
16 reduction is -- is not as great simply because the
17 water flows are increasing in Blairmore Creek. We are
18 talking about the sulphate and the selenium and the
19 hardness changing, and we understand that, and what we
20 are offering is to bring science to bear to ensure that
21 we stay within safe boundaries to protect the aquatic
22 environment in -- in Blairmore Creek. And we've
23 proposed a number of contingency plans. What if this
24 happens? What if that happens? And so we've proposed
25 contingency plans for -- for the things.

26 And you've asked me earlier, you know, is a metal

1 treatment plan in or out? Is this in or out? Well,
2 they're -- they're all operational items that we have
3 committed to implementing, if necessary. The -- you
4 know, we're also doing a lot of work that we can't put
5 on the record right now related to reducing the impact
6 at its origin, that is, avoiding the ex-pit dumps or --
7 or minimizing the ex-pit dump rock quantity.

8 So there's a lot of work going on. We understand
9 the importance of this. We understand that eliminating
10 the -- the issue at its source might be the -- the best
11 path forward. And to the extent that we can do that,
12 we're -- we're working hard in that area as well.

13 I don't know how to conclude this, Mr. O'Gorman.

14 I --

15 Q You --

16 A -- rambled on a bit.

17 Q I mean, it was a question designed to give you the
18 opportunity to ramble on and try and summarize it all
19 for us, which I -- I think you took a good shot at,
20 especially for 4:30 on a Saturday afternoon, at the end
21 of a long week that your panel has been questioned.

22 So I do, gentlemen, have one other area to throw
23 at you. It will also require you to sort of give me a
24 bit of a comprehensive response.

25 Mr. Chair, I think maybe -- could we just take
26 five minutes to talk amongst ourselves and make sure

1 that I have reviewed my notes to make sure that this
2 last question I have really is the last one? And it is
3 one that might take a five-minute response, so --

4 THE CHAIR: Okay. Yeah. That's fine.
5 Let's take five minutes. We'll resume at 4:45.

6 (ADJOURNMENT)

7 THE CHAIR: Go ahead, Mr. O'Gorman.

8 MR. O'GORMAN: Thank you, Mr. Chair.

9 Q MR. O'GORMAN: Okay, folks. It's been a long
10 two -- two-and-a-bit days of my questions. There's an
11 entire area that I didn't ask you about, and I think
12 almost no one has over the course of this last week, or
13 it's been very minimally discussed, at least, which is
14 all the non-selenium potential contaminants --
15 contaminants of potential concern.

16 So I considered going into those in depth, and I
17 think what we decided to do is to give you sort of a
18 holistic question on those. And I referred to them a
19 minute ago, so you assumedly knew this is where I was
20 going to go.

21 So I will read this. It's late in the day. I'm
22 past the point of being able to freestyle my questions,
23 so I'll just read. Water quality modelling results are
24 presented by Benga in Registry Document 313. That was
25 Addendum 11, Appendix 6.25, for Blairmore Creek and
26 Gold Creek, and they predict exceedances of the 2018

1 Alberta guidelines for chromium, cobalt, ammonia, and
2 nitrate and the Canadian environmental quality trigger
3 value for phosphorous in oligotrophic systems. We've
4 already pointed out and we've discussed that the
5 modelling of selenium and sulphate concentrations in
6 that appendix produces predicted mean monthly
7 concentrations which are higher than those referenced
8 by Benga in its derivation of the proposed
9 site-specific water quality objective for selenium.
10 It's higher than concentrations used in sulphate
11 toxicity tests conducted by Benga. And on top of that,
12 you've also produced Benga's produced predicted water
13 quality in the end-pit lake. Predicted concentrations
14 of various contaminants in there are a cause for
15 concern. Several predicted contaminant concentrations
16 exceed guidelines, sometimes substantially, including
17 selenium, arsenic, cadmium, cobalt, copper, nickel, and
18 zinc.

19 And I will clarify -- I said I wasn't going to
20 freestyle -- but we are saying you predicted for all of
21 those various contaminants a -- you know, constant
22 exceedances but exceedances that vary at points in
23 times above guidelines.

24 So this morning in response to one of my
25 questions, we -- well, in various ways we heard Benga
26 express some reservations about the modelling used to

1 produce the predictions in that appendix in Addendum
2 11, which was submitted just in earlier 2020. However,
3 as we've noted before, conservatism is the underlying
4 basis for our deliberations in this process. So I
5 would like to ask two questions now, with that
6 preamble, and I will read them both together.

7 How confident are you, based on your modelling
8 results in Addendum 11 for Blairmore Creek and Gold
9 Creek, that the predicted concentrations, especially
10 ammonia and phosphorous -- but also all the
11 concentrations, since all of the contaminants will be
12 present together in the receiving environment -- how
13 confident are you they will not represent a significant
14 adverse effect to the aquatic environment, particularly
15 to westslope cutthroat trout, during the years of
16 operation and into the first years of post-closure?
17 That's Part 1.

18 How confident are you, based on your modelling
19 results that we've just discussed, for the -- in
20 Addendum 11 -- sorry, for the end-pit lake that the
21 predicted concentrations of contaminants of potential
22 concern will not represent a significant adverse effect
23 to the aquatic life in the end-pit lake that might, you
24 know, be there in the foreseeable future?

25 And Part 3: Given uncertainties associated with
26 the predicted concentrations and the potential

1 consequences to aquatic life, notably to the westslope
2 cutthroat trout, would Benga deploy treatment from the
3 start for these additional contaminants of potential
4 concern that are predicted to exceed guidelines, and I
5 mean from the start of operations? This would include
6 metals and metalloids, such as arsenic, chromium, and
7 cobalt, as well as ammonia and phosphorous.

8 Now, that's my question. I don't know if you want
9 to take a minute to think about a holistic answer to
10 that. You can, if you want.

11 A MR. HOUSTON: Let me take this,
12 Mr. O'Gorman, and I think I've got all the parts here.

13 So I'll start by talking about ammonia. And that
14 was brought up earlier this week. On -- on inspection
15 we realized that we had included an overly conservative
16 estimation of source ammonia in our -- in our
17 modelling, and so we corrected that in a response to an
18 undertaking earlier this week. We don't consider that
19 ammonia will be something that should be on this list.

20 With respect to the other metals, let me say the
21 exceedances are an artifact of quite conservative
22 analyses. Conservative in our assumptions taken for
23 the -- for the source terms, the -- the rates at which
24 these metals will get into the water. Also, you know,
25 conservative given some of the other things I said
26 about, you know, trying to mitigate at the source

1 the -- the origins of some of these metals.

2 So with the conservatism, and given the nature of
3 the exceedances, we consider at this point that it may
4 be unlikely, or at least it's not certain, that we'll
5 require a metals treatment plant.

6 We have talked about a pilot project to -- or
7 pilot SBZ, I guess a field-scale pilot for the SBZ, and
8 we talked with you, Mr. O'Gorman, about using that
9 pilot as a point to inform us whether we need to work
10 harder on a metals removal plant or -- or if it's --
11 remains something that's in the unlikely category.

12 As the project progresses, the -- the waste rock,
13 which is the primary source for a lot of these things,
14 and the SBZ, will develop not in one fell swoop, but
15 gradually the waste rock will pile up, the -- the
16 water -- the contact water will grow over more than a
17 decade as we continue to mine and continue to build up
18 the waste rock and then start to collect the contact
19 water and treat it. So that -- that slow build-up will
20 give us additional information to inform decisions
21 around mitigation.

22 We don't consider that it's necessary to invest in
23 a metals treatment plant from the get-go. We think
24 it's something that very much is on the wait-and-see
25 list. And we think that we can take time to develop
26 our data more substantially and still implement a

1 metals treatment plant in time to avoid any -- any
2 water quality issues in -- in the -- in the creeks.

3 As I mentioned earlier, Gold Creek is a little bit
4 apart in that it's not -- it's not expected to receive
5 significant contact water. A little bit through
6 seepage, yes, but that itself will arrive over time,
7 and the quantities are relatively small.

8 Blairmore we think we have time to review the need
9 for metals treatment facility as -- as we continue to
10 monitor the -- the results of our -- of our field-scale
11 pilot and then the early days of the SBZ treatment
12 process.

13 What is clear is that we have committed to install
14 that facility, if it's necessary. What is clear is
15 that we've got a good appreciation for what kind of a
16 facility -- a facility it would be, and that that
17 technology is readily available and readily understood.

18 So those -- those things are clear. That we have
19 time to assess this situation further is also clear.
20 And so we feel we've put forward a proposal that is low
21 risk, is prudent, and which we feel we've made the
22 commitments necessary to give -- give the regulator
23 some comfort that we will implement those things when
24 and if they are signalled to be necessary.

25 You asked about the end-pit lake. That -- that is
26 in the same category but even a little bit further out

1 there. We have -- we have modelled some estimations of
2 contaminants concerning the end-pit lake, which may in
3 fact materialize. Again, we're not sure if they will.
4 We -- we've taken some conservative assumptions, and
5 we've identified that, yes, they may.

6 I think -- we think that our understanding of the
7 inputs to our modelling, and base -- based on the
8 general operation, will be much more clear as we move
9 through the operating life of the mine, and we will be
10 in a better position to assess whether that will occur,
11 and what options we have to manage any elements of
12 concern in the end-pit lake downwards. And that --
13 that would start with the design of that end-pit lake.
14 It's not final right now.

15 But as we understand whether the assumptions we've
16 made are conservative in the rest of the project, that
17 will help us to understand whether we have to make some
18 design adjustments on the end-pit lake to mitigate or
19 avoid similar concerns in the end-pit lake.

20 It's -- it's not planned to be a fish-bearing
21 lake, but we do understand that there will be life at
22 the lake, and -- and that could include fish. So we do
23 understand that. And the objective would be to arrive
24 at an end-pit lake that is a healthy part of the
25 environment. But we do understand that that's some
26 years out, and that we have time to gather more

1 information, and we have time to adjust the design of
2 that end-pit lake to arrive at a good conclusion.

3 We will be regulated through the life of this
4 mine. I know you gentlemen understand that, and I --
5 we -- we look forward to working on all these issues
6 and developing more precise strategies with the
7 regulators as we -- as we move forward.

8 I think -- I think I've touched on most of your
9 questions, Mr. O'Gorman. Let me know if I've left a
10 gap.

11 Q No. From my perspective, that's -- if that's your
12 answer, then that's all I'm going to ask you about, and
13 I -- you touched on all the things as near as I could
14 tell, yes, so ...

15 A Okay.

16 Q Okay. Well, allow me to conclude my bit. My -- my
17 colleagues may have one or two quick questions for you.

18 But to Mr. -- to you, Mr. Houston, and the entire
19 panel, it's been just over two days of a lot of
20 questions from me. I do appreciate everyone's, you
21 know, forthcomingness and taking the best efforts to
22 dig into the information that I was trying to get from
23 you to help us understand the impacts on this very
24 important issue from your project. So thanks very much
25 for the last couple of days.

26 A Thank you, Mr. Chair.

1 THE CHAIR: Thank you, Mr. O'Gorman.

2 Mr. Matthews, any questions?

3 MR. MATTHEWS: First of all, I just want to
4 thank the panel for enduring this long week, and I know
5 I personally gained a lot of key information that will
6 help me. So, again, thank you.

7 And I have no -- no questions, Mr. Chair.

8 THE CHAIR: Okay. Thank you,
9 Mr. Matthews.

10 Q THE CHAIR: I just have a couple of really
11 quick follow-up questions based on things that came up.

12 So at one point Mr. Fitch was asking you questions
13 about the underground workings and specifically about
14 whether or not they would need to be plugged, and there
15 was a bit of a dialogue about that. And I think I
16 understood Mr. Youl to say that there would be -- would
17 be plugged.

18 And, Mr. Houston, I think I understood from you
19 that those portals would potentially be under, you
20 know, 50 to a hundred metres of water kind of once the
21 SBZ are established. And there was a bit of a
22 discussion around the potential for those plugs to
23 failure, so I just want to -- sorry, to fail. So I
24 just want to quickly circle back to that.

25 If those plugs were to deteriorate or fail over
26 time, what would be the consequences of that, from your

1 perspective?

2 A MR. HOUSTON: I muted myself.

3 Maybe I can start, Mr. Chair, and then Mr. Youl
4 might have some additional thoughts.

5 I think we need to think about these plugs as
6 substantial width of material. We wouldn't be talking
7 about a -- you know, a -- a thin plug. We would talk
8 about something with substantial widths to it.

9 If you talk about failure, again, we -- we should
10 think about what the failure mode would look like. And
11 I -- I would think that a catastrophic failure of one
12 of those plugs would be an unlikely circumstance. That
13 would be a -- all-on removal of the plug and
14 essentially a bit of a hole in the side of our SBZ.

15 I would think that the more likely outcome would
16 be some seepage along the -- the wall of the plug or
17 something of that order. And that being the case, I
18 think it would likely be small compared to everything
19 else that we've been talking about.

20 Mr. Youl, do you have anything that you think you
21 could add to that?

22 A MR. YOUL: Thanks, Mr. Houston.

23 Mr. Chair, no, I concur with what Mr. Houston
24 said. These plugs would be engineered. They'll be
25 exposed in the high wall for a period of time while we
26 complete our mining operations, so be able to survey

1 those.

2 We understand the void space in the ultimate
3 saturated backfill and, therefore, the amount of water
4 pressure that's going to be exerted on -- on these
5 plugs, so all the information that's needed to apply
6 proper engineering principles to the design will be
7 there, and they will be heavily engineered.

8 But as Mr. Houston said, it's conceivable that a
9 little bit of leakage could emanate through -- through
10 those plugs, and we can implement monitoring wells.
11 We -- we already see seepage coming through those old
12 workings down at the seep -- lower down the mountain,
13 and that's being monitored. So we'll be able to
14 intersect any sort of seepage through the original
15 portals of that underground mine, which has all been
16 mapped.

17 So I believe there are solutions there to
18 eliminate or mitigate, and hopefully eliminate that
19 risk.

20 Q Okay. And I would assume that there are -- would be
21 water on both sides of the plug. Is that correct?
22 Like, the water -- the plugs are submerged below the
23 water table, so I'm presuming, you know, the portal
24 shafts would fill up with water. And so it's not like
25 the plug is holding back a big volume of water.
26 There's water on both sides of the plug; is that not

1 correct?

2 A That's -- that's likely correct. There may be some
3 portals higher up that drain, but certainly lower down,
4 because of the interconnection of all of the old
5 workings, you're right, yeah, there will be some plugs
6 that will have water on both sides. But some higher up
7 may -- may have drilled water just on the outside, but
8 that will -- that will have a lot of pressure on it.

9 Q Okay. And if it was --

10 A And --

11 Q Yeah. If there was leakage, would it report to the
12 portal where the seepage currently occurs, or do we
13 know what would happen to that water?

14 A Yeah. We've got -- it's amazing, actually, the maps
15 that are being produced even from that era which, as
16 I've mentioned, we've tried to calibrate one with
17 drilling and radar surveying, so we'll continue to do
18 that and verify them. But they all connect back to a
19 single portal.

20 So if you can imagine a single portal driven in
21 the side of the mountain, this is old Beaujolais Mine,
22 and then as it progresses up into the coal seams, they
23 finger out into all different directions, but
24 ultimately they all come back to a single exit.

25 Q Okay. Okay. Thank you.

26 Just one other follow-up question on something

1 that's just discussed recently, and that was the
2 end-pit lake. And, you know, I think we're clear
3 there's no plans to put fish in at -- at least at this
4 point in time.

5 And it's never been explicitly said, but I would
6 interpret that to be because there's some uncertainty
7 that -- about the quality of the water being capable of
8 supporting fish. Is that the reason, or is there a
9 different reason?

10 A MR. HOUSTON: I think we would like to see a
11 lake that has water qualities capable of supporting
12 fish. We're -- you know, with the issues related to
13 westslope cutthroat trout, I think it's a complex
14 question that we -- we would want to discuss with the,
15 you know, DFO and AER to see if they consider stocking
16 a lake like that as -- as an additional risk to the
17 westslope cutthroat trout. You know, if -- just we
18 don't want to introduce a new issue into -- into
19 that -- that discussion.

20 Q Okay. Thank you.

21 A Yeah.

22 THE CHAIR: Those are all my questions.
23 Mr. O'Gorman was fairly thorough in his questioning, so
24 there's not much left to be done.

25 So those are all the Panel's questions.

26 Mr. Ignasiak, any re-direct?

1 MR. IGNASIAK: No, sir. None. Thank you.

2 THE CHAIR: Okay. So thank you very much
3 to this panel for -- for all the time this week.

4 So just two housekeeping items before we depart.
5 So Monday morning at 9 AM we will resume with the
6 direct evidence from other participants. We'll start
7 with the Government of Canada, followed by CPAWS, and
8 then the Coalition. That might be as much as we can
9 get done Monday. There is some possibility, if things
10 go quicker than expected, we might get to Mr. Rennie.
11 And then there's also Timberwolf and Livingstone
12 Landowners Group. But it seems a little more likely
13 they will occur on Tuesday morning.

14 The other item is just to go back to
15 Mr. Ignasiak's suggestion about potentially combining
16 the air and the wildlife health risk sessions into one.
17 We did take a look at this kind of over the lunch
18 break. And while we agree there's probably some
19 efficiencies to be gained, it's not clear that this
20 would allow us to totally complete the hearing by the
21 end of next week if everybody takes as much time as
22 they currently asked for, and we didn't reduce any of
23 those times. But we recognize it could go a little
24 faster. So it seems like there's still a possibility
25 we may have to sit on the Monday of the following week,
26 and/or the Tuesday, even if we combined.

1 Having said that, there does seem to be some
2 advantages to that approach, which I'll just kind of
3 outline our thinking. In addition to what Mr. Ignasiak
4 suggested, which was having the air and health risk
5 witnesses on the same panel, that might be an
6 advantage.

7 It would allow at least some of the panels in that
8 later wildlife life health session to sit probably a
9 bit earlier within the time frame that was probably
10 originally contemplated for their witness -- witnesses.
11 And it does keep the door open to completing the
12 hearing next week, you know, if things go quicker than
13 proposed. But the Panel is not making a commitment
14 that that will happen at this point. There's just a
15 few too many uncertainties.

16 So the Panel's open to this. We would like to
17 hear from the other participants. It's late today, so
18 what I'll suggest is if people want to send an email to
19 the secretariat staff, that would be fine; otherwise,
20 I'll re-canvass the parties first thing Monday,
21 because, again, not everybody, I think, is even here
22 this afternoon. So out of fairness, I would like to
23 hear from the other participants.

24 So any questions about that?

25 Okay. With that, apologies for the very long day,
26 but this panel is now done. So we'll see everybody on

1 Monday morning. Thank you very much.

2 A MR. HOUSTON: Thank you.

3 A MR. YOUL: Thank you.

4 (PANEL STANDS DOWN)

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6 PROCEEDINGS ADJOURNED UNTIL 9:00 AM, NOVEMBER 23, 2020

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1 CERTIFICATE OF TRANSCRIPT:

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3 I, Claire Forster, certify that the foregoing
4 pages are a complete and accurate transcript of the
5 proceedings, taken down by me in shorthand and
6 transcribed from my shorthand notes to the best of my
7 skill and ability.

8 Dated at the City of Calgary, Province of Alberta,
9 this 21st day of November 2020.

10

11

12 <Original signed by>

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15 Claire Forster, CSR(A)

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17 Official Court Reporter

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