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

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GRASSY MOUNTAIN COAL PROJECT - BENGA MINING LIMITED

VOLUME 27

VIA REMOTE VIDEO

November 30, 2020

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(No Counsel)	For Ken Allred
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S. Frank	For Oldman Watershed Council
A. Hurly	
C. Longacre, RPR, CSR(A)	Official Court Reporter

(PROCEEDINGS COMMENCED AT 9:03 AM)

Discussion

THE CHAIR: Good morning, everyone.

Just a reminder that live audio and video streams and video recordings of this proceeding are available to the public through the AER's website and YouTube.

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

I have two preliminary matters before we get started, and then I'll open it up for others. First, just, Mr. Drummond, for your benefit, I know you have a witness that was not available this morning. I anticipate that we won't get to your panel till this afternoon, so I'm assuming that will resolve that issue.

The other item is with respect to final argument. Oops, just a minute. So the Panel has considered the submissions from the parties and Benga on the format and timing of final argument. With respect to format, Benga and the participants all expressed an interest in final -- sorry, written final argument, and the Panel supports a written final argument.

With respect to timing, the Panel agrees that final argument should occur in a timely manner. The

Panel also agrees that participants can make use of the time between the end of the hearing and the start of the Christmas/New Year period to work on their final argument. However the Panel does not believe it's appropriate to establish deadlines for written argument over the Christmas/New Year period and doesn't believe there's sufficient time to complete the submission of written argument from all participants prior to the Christmas break.

Further, the Panel does not accept Benga's contention that the participants have had time to and should've been working on their final argument while the evidentiary portion of the hearing was in progress. We note that the hearing schedule involved sitting six days a week for a number of weeks, and in addition to participating in or monitoring current hearing sessions, participants required time to prepare for upcoming hearing sessions. While they may have started their final argument, I don't think it's reasonable to expect that they would've had time to complete a lot of work on it.

The Panel understands Benga's desire for a timely decision on the project; however, completing final argument one or two weeks earlier will not have a material impact on the Panel's decisions and completion of its report. While the Panel will not be able to

make final decisions on the applications until final argument is complete, there is other work that the Panel can do during this time, and the time is not lost.

The Panel also recognized that the record for this proceeding is large and complex, including over 5,700 pages of transcripts as of Friday. For these reasons, the Panel has established the following schedule for written final argument: Benga written argument due Friday, December the 11th; participant written argument due Friday, January the 8th; Benga reply submission due Friday, January the 15th.

Of course, this schedule is contingent on receiving the ACO hearing report on or before Tuesday, December the 8th, to ensure Benga has sufficient time to review it prior to filing their final argument. If it's not received by that date, then we may need to adjust the schedule, but for the interim, the schedule is as outlined. The Panel will post the schedule or send a note to participants just confirming the dates so everyone is aware.

Those were the two items I had. Are there any other preliminary matters that participants want to raise?

Hearing none, Mr. Lambrecht, do you have questions for the Benga panel?

MR. LAMBRECHT: Yes, Mr. Chair, the federal analysts do have questions for the -- this panel.

MR. BRINKER: Mr. Lambrecht and Mr. Chair, just one minor item before we begin.

THE CHAIR: Yeah, go ahead. Go ahead, Mr. Brinker.

MR. BRINKER: Yes, Mr. Chair. Benga advised over the weekend that Mr. David DeForest would be made available as a Benga witness today for the purposes of answering questions from the Panel that may touch upon aquatic and fish health. We thought that that might be helpful to make him available. So he is on the -- on the Zoom call this morning. Mr. DeForest previously appeared in the water topic block, so it would just be a matter of confirming that he is still under oath or affirmation, and I could do that right now, if you'd like, before we continue with the questions from Mr. Lambrecht and the Panel.

THE CHAIR: Sure. Let's just do that in case it's needed. Sure.

MR. BRINKER: Mr. DeForest, can you hear me?

MR. DEFOREST: Hello. Yes, I can.

MR. BRINKER: Okay. Mr. DeForest, do you confirm you're still bound by your oath or affirmation given in this proceeding?

MR. DEFOREST: Yes, I do.

MR. BRINKER: Thank you.

Thank you, Mr. Chair.

And I apologize, Mr. Lambrecht, for interrupting.

THE CHAIR: Okay. Thank you, Mr. Brinker.

MR. LAMBRECHT: Thanks, Mr. Brinker.

THE CHAIR: Okay. Go ahead.

MR. LAMBRECHT: Thanks, Mr. Brinker. No problem at all.

GARY HOUSTON, MIKE BARTLETT, RANDY RUDOLPH, JANET BAUMAN, DANE MCCOY, STEVE BILAWCHUK, IAN MITCHELL, JOHN KANSAS, LINDSEY MOONEY, DAVID DEFOREST,
Previously Affirmed

(Dust, air quality, greenhouse gas emissions, noise, and light; wildlife, including migratory birds and species at risk, wildlife health, and human health risk assessment)

Joint Review Panel Secretariat Staff Cross-examines Benga Mining Limited

Q MR. LAMBRECHT: Panel, my name is Kirk Lambrecht. I am one of the counsel to the Panel, and I am working with the federal analysts, and there are a few questions on wildlife and air topics that I'd like to pose to you from the federal analysts.

And the first of these is a question that was deferred from the vegetation topic, and it relates to the Clark's nutcracker bird. And I would like to -- we

deferred it from vegetation because the panel of the vegetation topic thought it would be best for the person who knew about the Clark's nutcracker to be available, and I think that person is on this panel today. And I begin my questions by asking who that might be on the panel that I could direct these questions to?

A MR. KANSAS: That's Mr. John Kansas, is the biologist.

Q Good morning, Mr. Kansas.

Would you be able to answer a few questions on the nutcracker?

A Good morning.

Yes, I -- I -- I will do my best.

Q Thank you, sir.

Now, I'm going to pose my questions to the panel generally. I would ask the witness with the best evidence to respond, but I leave it in the hands of the panel as to who that might be.

And so I begin -- Mr. Kansas, could I get some idea of your qualifications and -- just very briefly, your qualifications and role in the EIA as it affects the Clark's nutcracker?

A Yes. I -- I reviewed the environmental impact assessment -- or statement, as well as the -- the supplemental information requests pertaining to Clark's

nutcracker, and I'm prepared to speak to that.

Q Did you have a role in the preparation of the EIA yourself, sir, or --

A No, I -- I did not.

Q All right.

MR. LAMBRECHT: So, Zoom Host, I'll ask you to pull up CIAR 89. This is the eighth addendum to the EIA, and I'd like to begin at PDF 20, please. And if you could zoom in. It's the second paragraph -- the first sentence of the second paragraph I'd like to focus on.

Q MR. LAMBRECHT: Panel, are you able to see that paragraph there?

Panel, are you able to see that, or, Mr. Kansas, are you able to see that on your screen?

A MR. KANSAS: I am able to see that. Thank you.

Q All right. So the sentence that I want to focus on that kind of forms the theme of my presentation is this one: (as read)

> The Government of Alberta notes that the Clark's nutcracker has a restricted distribution within the province and that its dependency on declining species, such as limber pine and whitebark pine, make it vulnerable to population declines.

MR. LAMBRECHT: If I can ask you, Zoom Host, then, to go to PDF 29, please. And if you could scroll down a little bit, please. Yes. It's the paragraph right there.

Q MR. LAMBRECHT: So, Mr. Kansas, the proponent proposes to cut down some whitebark pines, but proposes also to replant them. And this sentence -- the first sentence of the final paragraph, I believe, on this page says that: (as read)

> While successful planting of whitebark pine and limber pine on reclaimed sites would mitigate habitat losses for Clark's nutcracker, benefits to the species would be delayed many years into the future.

And it goes on to explain that it takes many decades for the Clark's nutcracker -- or for the whitebark pine to develop cones that the Clark's nutcracker then accesses.

MR. LAMBRECHT: So you can take that down, Zoom Host.

Q MR. LAMBRECHT: Sir, my appreciation is that the re-establishment of the whitebark pine is partly dependent upon the Clark's nutcracker because that bird takes the seeds of the whitebark pine and plants them all over the landscape as a feature of the birds foraging. Is that your understanding as well?

A MR. KANSAS: Yes. The whitebark pine tree is almost fully reliant for plant -- for seedlings on the Clark's nutcracker.

Q And I understand the proponent did some surveys of the Clark's nutcracker during its preparation of the EIA. Could you summarize just very briefly what the result of those surveys were?

A Yes. The -- there were -- there were no specific surveys designed or implemented for Clark's nutcracker; however, 60 or 70 songbird call counts were conducted for other bird species in the area. And in one of those, a Clark's nutcracker call was -- was detected.

Q Did the EIA conclude anything about the numbers of Clark's nutcracker in the -- in the local study area or the regional study area for wildlife?

A Well, there's been a series of supplemental information requests on -- on that topic. Really, there's no -- there's not enough information right now. The reason being, Mr. Lambrecht, is that the Clark's nutcracker nests and -- and -- is in their peak of breeding in late winter, so March-ish kind of thing. And the songbird surveys are in May -- late May and June. So that is my feeling why the -- that bird wasn't picked up more than just once.

And, also, the -- just so you know as well, the -- the bird was picked up -- I actually saw the bird in

one of my field -- field trips. I saw two adults and -- and three fledgling young up and -- at the junction between the montane zone and the subalpine zone in the vicinity of whitebark pine in late July of this year. They were clearly a family group. So there is breeding going on up there.

But in terms of -- of a relative abundance index or a population index, no, there's not enough information to -- to come up with that.

Q All right. Thank you, Mr. Kansas.

Now, you mentioned just briefly the montane region, I believe. And could I ask you to describe just briefly what the montane region is?

A Yes. The montane natural subregion of Alberta is one of 21 -- 20, 21 subregions that frame the province ecologically. They're a broad -- these subregions are -- are broad repeating patterns of -- of topography and climate and land form and, ultimately, vegetation and wildlife that occur throughout the province.

Half of the project footprint in -- in approximately half of the wildlife local study area, the lower portion, southern portion occur in the montane zone. The northern half of the -- of the -- of the footprint and the study area occur in the subalpine natural subregion. The montane subregion is a -- I would say it -- it's an uncommon subregion from a area

point of view. It's one of the smaller subregions. It's also a very unique subregion in the province, especially in the -- in the -- in the southwest Alberta area where the natural regions tend to be compressed into a little -- little -- little area. You have foothills fescue, montane, subalpine, and alpine in a very short distance, 20, 30 kilometres. So it -- it makes for an interesting dynamic -- diversity dynamic.

MR. LAMBRECHT: Zoom Host, could I ask you to go back to CIAR 89, the eighth addendum, and display page 761. This should be a map of the whitebark and limber pine occurrence in the regional study area.

Q MR. LAMBRECHT: Are you able to see that, Mr. Kansas?

A MR. KANSAS: I am. Thank you.

Q All right. This is one of the maps that we discussed during the vegetation section, and it -- in general terms, it displays the distribution of whitebark pine in the area.

MR. LAMBRECHT: If I can ask the Zoom host to go to PDF page 760, please. And if you could zoom in just a little, Host, please, and down to the legend.

Q MR. LAMBRECHT: Mr. Kansas, while this is zooming, I want to draw your attention to the bright-green areas there, which in the legend are indicated as "forestry operations to 2032". And

there's also a darker-green colouration in the legend for forestry operations to 2045, all of which I think are within, generally speaking, the span of the mine through operations and decommissioning.

MR. LAMBRECHT: So, Zoom Host, if you could just adjust this map so that we could see more generally the area there.

Q MR. LAMBRECHT: Mr. Kansas, my question is this: Assuming that Benga plants whitebark pine during the decommissioning phase -- phases of its -- or the reclamation phases of its project, what is the necessity of the Clark's nutcracker to the success of that revegetation, and where is the expected recruitment of Clark's nutcracker to the reclaimed project area to come from?

MR. LAMBRECHT: And, Zoom Host, you can take that down.

Q MR. LAMBRECHT: But, Mr. Kansas, if you need to make reference to this, please --

A MR. KANSAS: Okay.

Q Please do so.

A I can -- I can attempt to answer that question. If you could allow me to frame the topic a little bit, Mr. Lambrecht.

Q Of course, sir.

A Yes. So Benga intends to remove 208 hectares of

whitebark pine forest -- open-forest environment. The 208 hectares amounts to 3.4 percent of the 6,019 hectares of whitebark pine that occur in that regional study area that you had just put up. So there's 6,000 hectares in that area. And that's the vegetation RSA, and it's also the grizzly bear RSA, same -- same area.

So 208 hectares really represents the size of a -- of a small fire in this region. An average fire in the southwest Alberta area is around 1,800 hectares. So we're talking about a -- a very small -- almost like an initial attack kind of fire. You've got flames up, they attack it, they kill it, and you're left with a 200- or 100-hectare fire.

So Benga, to mitigate, they're replacing the 208 hectares with 305 or something hectares. So 3 to -- 3-to-1 ratio approximately, and they're replacing the 21,000 trees with 63,000 trees.

So nutcracker's have -- like, a number of species in the regional study area of southwest Alberta here, the Grassy RSA are -- they've adapted through the millennia to fire. So for Benga to go in and -- and plant trees that they -- that they -- they take away is almost like an army of nutcrackers going in and driving their -- their beak into the -- into the ground and -- and creating opportunities for -- for seedling

regrowth.

So the -- the nutcracker, to fight against this -- this -- these natural disturbance regimes, like fire and -- and -- and insects, they -- they do things from a life-history point of view. One of them is that they -- rather than relying on the seeds of whitebark pine, they shift their diet in bad years -- bad-weather years, bad-climate years, weather mainly -- and they -- they switch to an omnivorous diet. They'll be eating benthic -- terrestrial invertebrates, insects, even small birds and -- and mammals that they kill. You know, so -- so the food switching allows them to -- to fight their way through some bad times.

The other thing is that they disperse. Clark's nutcracker dispersal ranges as far as 32 kilometres. So if you centre the -- the -- the -- the regional study area is approximately 25 kilometres from the centre of the -- of the -- of the wildlife local study area out in each direction. So these animals are capable of dispersing and finding the remaining 6,900 hectares of -- of whitebark pine forest that occur. Sorry to be so winded -- longwinded, but that's enough for now.

MR. LAMBRECHT: Zoom Host, can I ask you to pull up CIAR 89 at 760 again? That's the map.

A MS. BAUMAN: Mr. Lambrecht, it's Janet

Bauman here. I just wanted to jump in there and -- in response to your question, I think you asked if the Clark's nutcracker was required to re-establish whitebark pine. Am I -- am I correct?

Q MR. LAMBRECHT: I think the question was: To what extent would the prevalence of the Clark's nutcracker be a factor in the successful establishment of -- re-establishment of the whitebark pine through the reclamation phases that the proponent has proposed --

A Okay. So the --

Q -- given that it -- given that it may be displaced from the area by deforestation?

A Right. So they -- they don't have any effect on seedling establishment other than planting the seeds in the ground, and -- and Benga will be doing -- well, they won't be planting seeds. They'll be planting the seedlings. So in terms of those seedlings growing and establishing on the reclaimed landscape, the Clark's nutcracker is irrelevant to that.

Where the Clark's nutcracker becomes important to whitebark pine perpetuating on the landscape in the long-term is once the trees start producing seeds, is the Clark's nutcracker harvesting those seeds and then planting the seeds in the ground in their caches? And they'll be doing that in other stands. Like John said,

they'll be, you know, 32 -- up to 32 kilometres away in other whitebark pine stands that are already producing seeds. But in terms of the actual trees on the reclaimed landscape at the mine site, they -- they will have no effect on those seedlings that are planted establishing themselves.

Q Yes, I believe I'd --

A MR. KANSAS: If I could also comment --

Q -- understood that.

A Oh, sorry, Mr. Lambrecht.

Q Sorry, Mr. Kansas. Go ahead.

A Yes. If I could also comment, just helpful for -- for framing again, is that the montane region -- subregion is used by Clark's nutcracker during the winter, and then they -- as the summer progresses, they move up into the subalpine where the whitebark pine are. So they're -- they're essentially surviving on a -- on a food source that's not quite as good as the whitebark pine seeds, but this seems to be adequate for them to survive in the winter.

MR. LAMBRECHT: Zoom Host, can I ask you to display CIAR 89 at PDF 30, please?

Q MR. LAMBRECHT: Now, there's a reference here to "monitoring", and I understand that the proponent proposes to monitor use of the reclaimed whitebark and limber pine areas by Clark's nutcracker and other

species as a part of its monitoring program.

Can I ask you, please, to clarify Benga's commitment to monitoring for Clark's nutcracker use of the reclaimed project area? And without meaning to limit your response in any way, can I ask you, please, to include within the scope of your response these two matters: First, when Benga expects to begin monitoring for Clark's nutcracker use of the reclaimed project areas, and how long Benga may expect to monitor for?

A MR. HOUSTON: So maybe I'll take that, Mr. Lambrecht. I -- I -- I think I understand the direction of your question here.

So Benga would expect to be monitoring the -- the project area through operations and through a few decades after reclamation, and -- and the -- the end point for the monitoring would be that we get reclamation certificates indicating that the -- the reclaimed areas are well-established and on a -- a good trajectory. I am doubtful that -- well, I -- I wouldn't think that the whitebark pine would have started producing seeds by that point, being that the -- the seed production is -- is not until after five or six or seven decades. So I wouldn't expect that we'd be monitoring for Clark's nutcracker at that point.

What we would be doing is we would be monitoring

for songbirds and -- during those first couple of decades after reclamation is complete and -- but I -- I wouldn't think that we'd be monitoring seven or eight decades out to see if the Clark's nutcracker had returned after the whitebark pine were mature.

Q So where is this expected recruitment of Clark's nutcracker to the reclaimed project area expected to come from given that there may be some uncertainty about the extent to which the bird being displaced from the mine area may be able to forage in other areas?

A MR. KANSAS: I would assume, Mr. Lambrecht, that it -- the -- the source of seedlings comes from Benga. Benga becomes the -- for a little while, becomes the Clark's nutcracker.

Q Yes, but where is the bird going to come from in future decades?

A Well, the birds will remain plastic with respect to dispersion. Birds will come from the outer western edge of the regional study area; they'll come from the north end and work their magic that way.

Janet, do you have a comment on that?

A MS. BAUMAN: No, I didn't have anything to add to that.

Q All right. Panel, I'd like to move on.

MR. LAMBRECHT: Zoom Host, you can take this page down. Thank you very much.

Q MR. LAMBRECHT: Panel, there has been some mention of the importance of this -- of the re-establishment of bison to this area from the Ktunaxa and some of the other Aboriginal groups. I appreciate that some of the landforms are taken up for other uses, but I wonder if anyone here on the panel is able to comment about the suitability of montane -- of the montane region for plains bison habitat?

A MR. KANSAS: Well, I suppose that lands on me here. I -- I'm -- as for many biologists, I'm -- I'm not an expert with bison, especially with respect to reintroduction into a very busy ecosystem here.

I'll just -- a quick -- a quick anecdote. When I was just a young biologist, 22, in Jasper Park, they -- this -- the -- I was there for a few years, and in my first year, Canadian Wildlife Service flew in 35 bison into the lower Athabasca River valley of Jasper National Park. Ultimately, they were all -- they were all killed, mainly by train accidents and by vehicle accidents. So I -- the montane -- all things being equal without the level of -- of the -- especially the trains and the trucks and the vehicle collision potential, it's good habitat -- well, it was good habitat 150 years ago or more, but right now, I -- I think it's a -- it would be a -- what we'd call a "primary sink". It would lead to unnecessary deaths.

Having said that, I -- I love the idea of bison in -- in -- in the mountains. They're doing it in Banff right now, and I intend to go into that ecosystem this winter and -- and check to see how it -- how it's looking. Anyways, that's -- that's all I can offer, really, in that.

Q Thank you, Mr. Kansas.

MR. LAMBRECHT: Zoom Host, can I ask you, please, to pull up CIAR 503 and PDF 15.

Q MR. LAMBRECHT: Panel, there are two passages from the proponent's documents I'm going to present here, and then I'll pose a question to you regarding them. And the first one is the second bullet from the top.

MR. LAMBRECHT: So, Zoom Host, if you can zoom into that a little bit, please.

Q MR. LAMBRECHT: All right. This is about pre-disturbance surveys, and this bullet in this document, which is the -- I understand, the hearing submission filed by Benga, states that: (as read)

> Pre-disturbance surveys will be conducted along the edges of all the areas to be cleared during project development to determine the occurrence of any important wildlife habitat features.

MR. LAMBRECHT: Zoom Host, if I can ask you,

then, to pull up CIAR 360. This is, I understand, Benga's response to the Joint Review Panel request for additional information. It's Package 7, reference listed consolidated mitigation tables, Addendum 12, and specifically we're on PDF page 105, Item Number 7. So in the middle column, Item Number 7. If you could zoom into that, Zoom Host.

Q MR. LAMBRECHT: And this document says that: (as read)

> Pre-disturbance surveys or wildlife sweeps will be conducted in the development area prior to any construction activities during project development to determine the occurrence of any important wildlife habitat features, such as migratory bird nests, et cetera.

So my question is --

MR. LAMBRECHT: And you can take that down, Zoom Host.

Q MR. LAMBRECHT: -- can I ask this panel to clarify, please, whether the proponent will conduct wildlife surveys along the edges of the areas to be developed or within the -- the whole of the areas that may be developed during these wildlife sweeps or surveys? Thank you.

A MR. HOUSTON: Just to be clear on -- on the

question, Mr. Lambrecht. Are you asking whether we would limit our wildlife sweeps to the trees that are actually going to be cut down, the area that's going to be cleared, or are you asking if we would do a survey that extends beyond that immediate area to include maybe an area slightly larger that might be disturbed by noise and activity?

Q Let me clarify. Thank you, Mr. Houston. I'm sorry I wasn't clearer.

The first quote appeared to say that the wildlife surveys would be conducted along the edges of the areas to be cleared, and the second mitigation suggested that the whole of the area might be surveyed. So I'm asking, really, for clarification about the geographic extent of the wildlife survey area. Is it the edge or the area to be cleared?

A So -- so I'll -- I'll take that. No. We'll -- we'll do a sweep of the entire area to be cleared on a -- on a year-by-year basis. So it would be a progressive approach that would be looking ahead to the next batch of clearing and sweeping the entire area that would be cleared.

Q Mr. Kansas, can I come back to you for a moment, please?

A MR. KANSAS: Sure.

Q You may not be in a position to answer this, but a

follow-up question on the Clark's nutcracker. Will Benga conduct the surveys for the Clark's nutcracker during its breeding season that is in the late winter?

A I can't speak for Mr. Houston; however, my professional opinion is that it -- that should be done.

Q Now, let me interrupt you for a moment. I -- I'm not -- I -- I may have confused you because of juxtaposing this question on monitoring with the question about the pre-cleared surveys. So to be clear, this question relates to the monitoring that Benga indicated that it would do to monitor for re-establishment of Clark's nutcracker, and --

A I think --

Q -- I'm wondering --

A Go ahead. Go ahead. I'm sorry.

Q I'm wondering if these surveys will be conducted during the breeding season for that bird that you described earlier?

A Yes. It would be pointless to go again too late. You know, it needs to be done during the March/April period.

Q And, Mr. Houston, do you know if that would be the intent of Benga in its monitoring program for this specific species?

A MR. HOUSTON: Certainly. Up until now, access during the winter months has been a bit of an

issue. Once -- once we're in and especially when we're starting to reclaim areas of the mine, I would expect that we would have monitoring programs that would run year round, and not just for the Clark's nutcracker but other wildlife as well that we would want to be monitoring on a year-round basis around the perimeter of the site and -- and on -- on the newly reclaimed parts of the site as well.

Q Thank you, sir.

Panel, I'd like to move on to a question about carbon sink.

MR. LAMBRECHT: And perhaps I could ask the Zoom host to pull up CIAR 70. This is the response package dated April 2018 for additional information requested by the agency on February 28th, 2018. And I need to ask you, please, to go to PDF 527. Now, we have a chart here, and I need to ask you to go to the row for "Proposed Mitigation". And in that column -- it's the fourth row down. So if you can just scroll up a bit. That's great.

Q MR. LAMBRECHT: Toward the bottom of that, panel, the statement is made that: (as read)

> GHG [or greenhouse gas] sink losses are addressed by amending soil with woody debris or fertilizing and revegetating stockpiled soil and prompt reclamation and reforestation

of the project disturbance and the historical mine disturbance and minimizing lifetime of soil stockpiles.

So my question -- now, I appreciate --

MR. LAMBRECHT: You can take that -- Zoom Host, can you scroll over to the left a little bit so that we can see the valued component that is involved here? This is a -- so this is a proposed mitigation for greenhouse gas emissions. And, Zoom Host, you can take that down.

Q MR. LAMBRECHT: Is Benga able to provide a quantitative estimate of carbon sink loss over the planned duration of project operation prior to reclamation as well as a time estimate to regain the lost carbon sink?

A MR. HOUSTON: Mr. Chair, maybe we'll just take a minute to talk amongst ourselves to see who's best to answer this question. One minute.

So, Mr. Lambrecht, I don't think we have an answer for your question. We haven't quantified the -- the -- the greenhouse gas sink that would be lost, and I would expect that full recovery would not occur until we had significant progress through the reclamation process. But we don't have a specific answer to your question.

Q All right. And so if I were to ask for an approximate timeline of carbon sink recovery from revegetation and

reforestation, I take it that -- that your answer would extend to that question as well?

A Yes, that's right.

Q All right.

A Don't -- don't have a good answer for you.

MR. LAMBRECHT: If I can ask the Zoom host to pull up CIAR 251. This is Response Package Addendum 10, Package 1, "Air Quality and Noise". And go to PDF page 109.

Q MR. LAMBRECHT: Panel, this is the greenhouse gas management plan that the proponent has put forward, and it does not make any reference to "carbon sink loss or replacement".

I would like to ask: How will Benga update the greenhouse gas emission -- or greenhouse gas management plan to incorporate managing carbon sink loss and measure reclamation efficacy in terms of greenhouse gas sequestration?

MR. LAMBRECHT: Zoom Host, you can take that down. Thank you.

A MR. HOUSTON: So your question is how we would estimate the -- the loss of greenhouse gas sink due to the removal of the vegetation on the site and then how we would evaluate the efficacy of the reclamation in terms of returning the greenhouse gas sink? Is that the question?

Q MR. LAMBRECHT: Yes, sir. The chart that I had taken you to did propose a mitigation for the greenhouse gas sink, but the plan doesn't make reference to that. So I'm wondering how you would fit that mitigation into your plan, as you've described.

A I -- I think the -- the first -- the first step along those lines would be to evaluate the magnitude of the greenhouse gas sink loss and determine whether it was significant compared to the other greenhouse gas impacts of the project and -- and to proceed from there. We could commit to updating the greenhouse gas mitigation plan by -- by doing that, by making an estimation of the sink loss. The -- the recovery of that sink loss, however, I think, would depend on the -- the successful reclamation of the site.

Q All right. I'd like to move on to a question about diesel -- use of diesel.

MR. LAMBRECHT: And, Zoom Host, can I ask you, please, to pull up CIAR 55, Attachment 2. This is the fourth addendum to the environmental impact assessment. And can I ask you to go to PDF page 18. And I believe we're in the second paragraph from the top here.

Q MR. LAMBRECHT: Panel, are you able to see that page on your screens?

A MR. HOUSTON: Yes, we can.

Q Now, the question, really, here is: Can Benga provide

an update on the availability of lower carbon diesel fuel, as is described in this paragraph?

A Well, as you know, Mr. Lambrecht, the Sturgeon Refinery has -- has progressed and, I believe, is producing -- producing diesel. So that -- these projections have come about in terms of general improvement in diesel availability from -- from other sources. I -- I -- I am afraid I can't comment on that.

I wonder if Mr. Rudolph has any -- anything to add there.

A MR. RUDOLPH: I -- I don't have much to add. I think we're -- you know, we're aware of the new legislation from the federal government that would -- that would somewhat reduce the carbon content in fuel.

I think, though, that the -- the estimate here of, perhaps, a 30 percent reduction in greenhouse gas emissions is probably an overstatement, and I think that's been pointed out in -- in more recent material, that this is probably not -- this would be more than an upper-end estimate to the improvement that we'd expect on-site as a result of -- of lower carbon fuel becoming available.

Q Panel, is the estimate of a potential 900 kilotons of greenhouse gas emission reduction still valid?

A I believe that's an overestimate of the -- of the reduction from this source.

Q Would you be able to offer a quantification of the reduction that may occur if diesel from this source were utilized?

A I don't know that I can do that without a bit more effort, but I would -- I would think it would be less -- that the fuel economy improvement would be probably less -- or around 5 percent, not 30 percent from the use of diesel.

MR. LAMBRECHT: Can I ask you to scroll down on this same page a little bit more, Zoom Host, please. That's good right there.

Q MR. LAMBRECHT: In the first paragraph, panel, under the heading "Electricity Consumption", the proponent states that: (as read)

> If all coal were replaced with natural gas and assuming that natural gas emission intensity of GHG is about 55 percent of that of coal, that the overall GHG intensity of the grid and, therefore, Benga's share of that would be reduced by about 28 percent.

Does Benga have any updates at all to this assumption or statement?

A MR. HOUSTON: So I think the Alberta government has stated its intention to phase out coal-fired power over -- I -- I'm not sure what the -- the current estimate for a time frame is, but during

the life of the project, we -- we would expect a migration from coal-fired power in Alberta to natural gas-fired power as an evolution in the -- in the power sector.

Q All right. Is the proponent in a position to provide an estimate of a potential indirect greenhouse gas emission reductions from coal phaseout in comparison to the existing projections of anticipated project greenhouse gas emissions?

A So our -- our -- our total emissions from electricity use are 120 kilotons per year. That -- and that's for the worst year, the 19th year of operations. And so we would suggest that an estimate could be taken by using this 28 percent times the 120 kilotons as an annual reduction.

Q Are you able to provide some definite calculations in that regard, and, if so, when might you be in a position to do so?

A One minute.

Q Thank you, sir.

A A little bit more than 30 kilotons a year, Mr. Lambrecht --

Q Thank you --

A -- reduction.

Q Thank you, Mr. Houston.

MR. LAMBRECHT: Zoom Host, this page can come

down.

I'd like to ask you to pull up CIAR 542 at PDF 63, under the Heading "Recommendation", 6.3. It might be ... Yes. There we are.

Q MR. LAMBRECHT: Panel, I'm drawing your attention to a recommendation made to Benga by Environment and Climate Change Canada. We are here at Recommendation 6.3, and Benga had recommended what I'm going to describe as a "BAT/BEP determination", which I think is "best available technology/best environmental practice". And I know that the Panel would have reviewed this recommendation.

So I'll ask the Zoom host to take it down and call up CIAR 571 at PDF 16. Under heading 3.9, Benga made some reference that -- to considering the issue of greenhouse gas emissions and reasonable mitigations through the life of the project. But from my review of this, I could not locate a specific reference to the Environment Canada -- and Climate Change Canada Recommendation 6.3.

So can Benga clarify if it is willing to commit to update its greenhouse gas management plan to incorporate the BAT/BEP determination and implementation as recommended by Environment and Canada -- Climate Change Canada in Recommendation 6.3?

MR. LAMBRECHT: Zoom Host, you can take this

down. Thank you.

A MR. HOUSTON: Okay. I'm talking to myself.

So, Mr. Chair, the answer is -- the short answer is yes. All of the plans and programs that Benga has committed to develop as a part of this project will be maintained in an evergreen state. That means a -- a -- a -- a program or process for periodic review and -- and updating.

I -- I think in our -- our -- our October 5th response evidence, we went through a number of the technologies that had been proposed or -- or pointed out by ECCC or, more appropriately, by their consultant, who had talked about some of the technologies that might be considered. And I think what's important is that we begin this project with what we consider to be the best available technology or the -- I -- I'm always confused by that term, whether it includes proven economically feasible, and -- and so those factors will be rolled in.

But we've -- we've reviewed a number of the technologies pointed out by ECCC and their consultant and believe that we're starting this project on the right foot. Obviously as technology changes and becomes available, Benga will continue to evaluate and -- and consider how to roll the -- the newer technology in -- into the project through our normal

turnover of equipment and -- and updating of the project infrastructure.

But the answer is, yes, that we would continue to maintain a greenhouse gas management plan and -- and keep that up to date.

Q MR. LAMBRECHT: During an earlier panel, I had some questions on the mining fleet equipment, and my understanding is that the proponent is proposing to use diesel mining fleet equipment that represents probably the largest single GHG source of emissions for the project at about 40 percent of project emissions. Is that a fair understanding of the proportion of GHG emissions from the project that originate from the diesel-powered mining fleet?

A That -- that would be about right. My information for Year 19, again -- again, the year where there's the most activity on-site, the diesel -- the emissions from the diesel fleet would be about 170 out of about 360. So your number of 40 percent is -- is pretty close.

Q Now, Environment and Climate Change Canada had recommended consideration of the replacement of the diesel engine equipment with electric or hydrogen fuel cell equipment in order to reduce that amount of emissions.

Does Benga have any plans to consider whether to utilize mobile off-road non-diesel mining fleet

equipment at any point during the life cycle of the project in order to reduce its greenhouse gas emissions from this project?

A Again, Mr. Chair, we have considered those technologies at -- at this important moment, the initiation of the project, and -- and we have determined that, either because of the terrain, because of the mine plan where we -- we're going to have many -- many faces open at once or -- or -- or -- or because of the state of the technology, we've -- and we've, again, reviewed this substantially in -- in our document 571. We've gone through each of those technologies to talk about our -- our view of the technology at this point. And -- and, yes, of course, we would continue to follow those technologies through the life of the project and -- and at -- from time to time, consider adopting some of them as the technology matures or -- or as they become more suitable for our project.

Q Thank you, Mr. Houston.

MR. LAMBRECHT: Zoom Host, can I ask you to pull up CIAR 571 at page 17, I believe?

Q MR. LAMBRECHT: All right. Panel, are you able to see this on your screens?

A MR. HOUSTON: Yes, we can.

Q All right. What I want to refer you to specifically on this page are the last two bullets in that column of

bullets that appears in the first half of this page. This is a document from the proponent. It describes the proponent's greenhouse gas management plan as including many factors, and they're listed, some of them, in the bullets here. And the last two bullets are as follows: (as read)

> Requesting of Canadian Pacific Railway that they dedicate their lowest emitting units to the operations at the project to minimize emissions from rail transportation and encouraging the contractor to use large fuel-efficient vessels to minimize emissions from marine transportation.

MR. LAMBRECHT: Now, Zoom Host, if I can ask you to pull down that page and go to CIAR 907, please, at page 143.

Q MR. LAMBRECHT: This is a transcript from the November 25th testimony, and at the bottom, beginning at line 19, I think -- Mr. Houston, I believe this is your response to some of the questioning from Barbara Janusz, and you indicated that -- beginning at line 19 and going to 24, that: (as read)

> Benga will pursue additional greenhouse gas emission reductions associated with rail and marine transport by requesting Canadian Pacific Railway to dedicate its lowest

emitting unit to the project and encouraging the marine contractor to use fuel-efficient vehicles.

So if Benga cannot -- my question --

MR. LAMBRECHT: You can take this down, Zoom Host.

Q MR. LAMBRECHT: My question to you, panel, is this: If Benga cannot secure these commitments from the rail and marine shipping contractors, how will the lack of these mitigations affect Benga's ability to meet the goals of its greenhouse gas management plan?

A MR. HOUSTON: So, Mr. Lambrecht, I think we can only manage what we can manage, and that is the greenhouse gas emitted within the project boundaries. Outside of the project boundaries where the coal is being transported by others, possibly not even -- the coal may not even be in the possession of -- of Benga at that point at -- outside of the project, all -- all we can do is encourage our partners to -- to use the most sensitive technologies possible to reduce their -- their contribution to greenhouse gases. But we -- we have no control over those parts of the transportation chain.

MR. LAMBRECHT: Zoom Host, can I ask you, please, to pull up CIAR 251, tenth addendum to the environmental impact assessment, Package 1, "Air

Quality and Noise", at PDF page 116. And the heading "Fugitive Methane" is the heading that I'd like to ask you to zoom in to, please.

Q MR. LAMBRECHT: All right. Panel, I understand this is a part of the greenhouse gas management plan that Benga has prepared. And there's an indication here that Benga does not plan to use fugitive methane emissions or plan to measure -- I'll -- I'll -- I will reread this again for clarity: (as read)

> Benga does not plan to measure fugitive methane emissions from exposed seams or piles. Benga will continue to use IPCC emission factors based on production.

And so my question to you really relates to some of the fugitive methane emissions. Can I ask the panel to describe briefly what the IPCC emission factors based on productions are and how they relate to the measurement of fugitive methane emissions?

A MR. HOUSTON: One minute, Mr. Chair.

So, Mr. Lambrecht, the question was: Can we explain the IPCC emission factors? Is that the question?

Q Yes, and how they may relate to the measurement of fugitive methane emissions from exposed seams or coal piles.

A Okay. Mr. Rudolph, can you respond to this one?
A MR. RUDOLPH: Mr. Lambrecht, I think in -- in CR 1, that is CIAR 42, the air quality assessment, we've provided what the emission factors are that were used in the calculation. And in CIAR 55 at PDF -- let me look that up -- at PDF 16, we talk about the -- the potential ways in which methane is generated from surface mines.

So I think as -- as we would normally do for diesel emissions, for example, for the project, we would -- we would use an established emission factor and multi -- and -- and activity factor and base -- and -- and track, as part of the greenhouse gas management plan, the volume of diesel used. I think we would do something similar -- or the plan is to do something similar for fugitive methane as well and link the potential emissions from fugitive methane from the mine surface and other -- other areas to the production of coal using IPCC emission factors.

MR. LAMBRECHT: You can take this down, Zoom Host.

Q MR. LAMBRECHT: Mr. Rudolph, is -- are you -- or, panel, are you confident that the chosen emission factors are representative of the fugitive methane emissions from the project?
A MR. RUDOLPH: Mr. Lambrecht, the -- the IPCC

emission factors are based on -- on global emission factors, but we have no indication at this stage that the potential for emissions at the -- at the Grassy Mountain site is anything but average, let's say.

Q So, Mr. Rudolph, did I understand you to describe the plan to verify these emission estimates through monitoring or measurements in your prior answer?

A I -- I don't know that I used the word "verify". I think I -- I said that we would track emissions from the mine face based on the -- the coal production and a -- an activity factor or an emission factor based on the IPCC values.

Q All right. Thank you.

MR. LAMBRECHT: Can I ask you to go, Zoom Host, to CIAR 251, Package 1, "Air Quality and Noise", PDF page 42. And if you could scroll down there. That's good right there. Just a little bit up under the heading "Decommissioning and Reclamation Phase".

Q MR. LAMBRECHT: And, panel, I want to draw your attention to the paragraph that appears under the heading indicating that: (as read)

> Reclamation activities at the mine occur concurrently with mining activities that have been accounted for in the GHG assessment for peak project's operations and that other closure activities such as deconstruction

of -- of plant facilities, environmental monitoring, et cetera, may not be included in these estimates but that it is expected that GHG emissions from all sources are expected to be insignificant when compared to those in operations.

And I look down at the table that measures some of these emissions, and I see during reclamation, at the bottom of the table there, that it says that it's included in operations.

Then, in particular, the -- on this table, the highest annual emissions appear to come from mine operations. So my question is --

MR. LAMBRECHT: And you can take this down, Zoom Host.

Q MR. LAMBRECHT: -- is Benga confident that the predicted operations phase emissions conservatively account for all earth-moving equipment required to achieve the proposed closure landscape?

A MR. HOUSTON: So the -- the operations estimate include all of the equipment that are planned to be used -- again, this is Year 19 -- on the site. So it includes all of the equipment, including the equipment removing rock, the equipment mining coal, and the equipment managing the reclamation activities. So we are confident, yes.

Q Thank you, Mr. Houston.

Is Benga able to provide any quantification of the greenhouse gas estimates of unaccounted -- that were not accounted for in reclamation or closure activities?

A I'm not sure what you're referring to, Mr. Lambrecht. And ...

Q The chart that I had taken to you [sic] earlier indicated that some emissions might not be accounted for in the measurement, and I'm just wondering if you might be in a position to take -- Benga quantification of those, sir.

A So it would -- it would involve some equipment, but a fraction of what we're -- was in place for the operation for one or two years after closure -- after closure to finalize the reclamation; and from that point forward, it would be mostly electric -- electricity consumption. All the pumps used for the long-term water management would be electric. And I guess at that point -- and remember we're talking about 2045 and onwards -- we would hope that the electric -- the GHG component for electricity would be significantly smaller.

We don't have a quantification, Mr. Lambrecht, at this point, but it would be a small fraction of the annual GHGs during operations.

Q Panel, can I ask for clarification -- this question:

How has Benga accounted for the greenhouse gas emissions and re-establishment of carbon sinks for the proposed post-reclamation landscape?

A Is this the same question that we discussed half an hour ago, Mr. Lambrecht? We -- we -- we talked about not having an estimate of the -- the loss of carbon sinks or greenhouse gas sinks, and that could be done as part of the greenhouse gas management plan base -- based on trees removed or acres cleared, and then re-establishment of those sinks would depend on a successful reclamation program.

Q All right. Thank you.

MR. LAMBRECHT: Mr. Chair, I think this might be an appropriate moment for me to take a break. There may be one or two questions I have after the break, but I would like to consult with the federal analysts to see if there's much more that I need to ask. I need to come back to one question on the Clark's nutcracker, I believe.

THE CHAIR: Okay. It's -- excuse me -- 10:20. We'll take a 15-minute break and resume at 10:35.

MR. LAMBRECHT: Thank you, Mr. Chair.

(ADJOURNMENT)

THE CHAIR: Okay. Mr. Lambrecht, you can continue.

MR. LAMBRECHT: Thank you, Mr. Chair.

Q MR. LAMBRECHT: Panel, I have a few questions remaining, and so I would like to begin by going back to the wildlife topic, and I want to ask you a question about the phrase "wildlife sweeps" and the phrase "pre-disturbance surveys".

May I ask for clarification if these phrases are synonymous such that they might be used interchangeably? And if not, what is the distinction between them?

A MR. KANSAS: Okay. I'm sorry. I -- I -- I was zoned out for a second. If you could please repeat the question.

Q Yes, Mr. Kansas. No problem at all.

I want to go back to the wildlife topic and ask a question for clarification about the definition of the phrases "wildlife sweeps" and "pre-disturbance surveys". These phrases appear in the proponent's materials, and I'm wondering if we should interpret them as being synonymous with one another and interchangeable with one another when --

A Yes, they are synonymous.

Q All right. Thank you, sir.

A You're welcome.

Q For clarification, does the panel -- does Benga expect greenhouse gas emissions from some of the closure

components, such as the sediment pond and end-pit lake, and if so, has Benga estimated the potential emissions from those closure components?

A MR. HOUSTON: No, we wouldn't expect significant greenhouse gas emissions from either of those. They -- there is minimal organic material in either structure. They're -- they're ponds constructed on -- on mineral material, and so there would be very little organic material in those -- in those lakes or ponds to generate greenhouse gases.

Q Thank you, Mr. Houston.

MR. LAMBRECHT: For the final question, it might be helpful if I could ask the Zoom host to pull up CIAR 251, Package 1, "Air Quality and Noise" appendix, and go to PDF one -- let's start at PDF 115.

Q MR. LAMBRECHT: And, panel, this is a return to the question of fugitive methane emissions from exposed coal seams. I note in Table 4-1 that a potential source of greenhouse gas emissions is fugitive methane. A mitigation objective would be to reduce these emissions, but the -- nothing is planned at the moment.

MR. LAMBRECHT: And if I could ask the Zoom host to go to the previous page, I believe. Yeah. Just a little bit above, Zoom Host. Yes. Right there. Thank you.

Q MR. LAMBRECHT: And in the sentence above Table 4.1 [sic], panel, the statement of -- is made that: (as read)

> Coal bed methane recovery is not ongoing or being considered on the Grassy Mountain site, as the coal is not considered gassy, and, therefore, methane recovery is not practical.

And my question for you is: Has Benga identified -- ruled out any potential mitigation to reduce fugitive methane emissions?

MR. LAMBRECHT: And you can take this down, Zoom Host, thank you.

A MR. HOUSTON: So -- so, again, in our submission -- our October 5th submission, we -- we talked about this a little bit more. Based on our -- the -- the sampling that we've done and our evaluation of the deposits, we consider that the -- the rock and -- and the coal seams are already significantly exposed and that methane has -- has seeped from the -- the site over -- over the millennia, and -- and our -- our experience is that there is very low methane remaining in -- in the coal.

Nonetheless -- and -- and so during the handling of the coal, the exposure of the seams, and the stockpiling of coal, as -- as Mr. Rudolph mentioned, we will be assuming a -- a level of methane emissions

based on the IPCC coefficients. After closure, we will be -- we will be -- for -- for the majority of any remaining coal on-site, we will be reclaiming the site. So we will be covering the -- the seams and putting reclamation materials back. So that would be the final closure of the site to -- to reduce any long-term emissions from the remaining exposed coal seams.

Q MR. LAMBRECHT: Does Benga have any views, were the project to go forward, on a condition requiring Benga to develop and implement a plan to mitigate and minimize methane -- fugitive methane emissions?

A I -- I think the plan that we would propose would be, more or less, what I have just mentioned, Mr. Chair, that we could document that in a greenhouse gas management plan that -- absolutely we could do that.

Q Well, now, panel, I think I'm completed my questions. I'll just confer with the federal analysts for one moment.

All right. It appears that I have no further questions for you, panel. I'd like to thank you for your patience in responding to my questions and for your evidence to the Panel and your participation in the Joint Review Panel process. Thank you.

THE CHAIR: Okay. Thank you, Mr. Lambrecht.

So we'll now turn to Panel questions. We're going to switch it up a little bit. I've been working with the subject matter expert on questions related to the wildlife and human health risk assessment areas, so I'm going to ask my questions first, and then I'll turn to Mr. O'Gorman and Mr. Matthews to see if they have any further questions once I'm done.

Alberta Energy Regulator Panel Questions Benga Mining Limited

Q THE CHAIR: So my questions will focus on the wildlife health risk and human health risk assessments, and really the purpose is just to try and ensure the Panel understands what's been done and to -- so it can understand the level of conservatism in those two assessments.

I anticipate that the majority of my questions will be for Mr. Mitchell or Ms. Mooney, but, obviously, anyone on the panel who has something to contribute can speak to them if needed.

In the interest of time, I don't plan to pull up every reference. I'm going to put certain statements to you from your evidence, but I do have the reference, so if at any point something doesn't sound right or you want to see the actual reference, please let me know, and I'll make sure it's brought up, and there are other exhibits that I will pull up so you can have a closer

look at them.

Just before I get -- kind of get to my questions, though, I just wanted to follow up on the one question Mr. Lambrecht asked and, Mr. Houston, you answered, and it had to do with, kind of, custody of the coal along its journey from the mine to the customer. And, you know, I think the Panel understands that, you know, it'll first get loaded onto railcars, and then it'll get unloaded at the port, and then it'll get loaded on a ship, and you don't fully control some of those activities.

But what I was curious about was: At what point in the journey does the ownership of the coal transfer from Benga to someone else? Is that when it's delivered at the far end, or is there some intermediate point where custody may be transferred?

A MR. HOUSTON: So thank you for that question, Mr. Chair.

The current business plan is that custody would transfer in -- at the port in Vancouver, that Benga would maintain custody through the train journey to the port, and that the end customer would contract the -- the ship that would pick up the coal at the port. That's the current business plan. We don't envision it changing from that, but, of course, 25 years of operations is a long time, and -- and things can

change.

Q Okay. Thank you for that, Mr. Houston.

Okay. Turning to -- first, to human health risk, and the first series of questions deal with some of the calculations that were done and just trying to improve our understanding of some of those.

So in CIAR 360, Addendum 12, on pages PDF 10 and 11, Benga acknowledged that there were errors in arsenic input variables which were discovered while producing the worked examples of risk calculations resulting in changes to estimates of the incremental lifetime cancer risks. So this raises a concern about the potential for other errors which may have occurred in the calculation of hazard quotients for other contaminants or chemicals of potential concern.

THE CHAIR: So, Zoom Host, if you could pull up CIAR 360 and PDF page 174. Thank you.

Q THE CHAIR: So this work example includes equations such as Equation 7 which Benga describes as: (as read)

> The equation or contaminants of concern from air and surface water pathways were integrated to predict total surface water concentrations.

The worked example calculation for arsenic shown here using Equation 7 produced a concentration of

0.248 micrograms per litre in surface water.

Benga then presents surface water arsenic concentrations in CIAR 360, Table 7.1-2, on PDF page 13. So could we go to page 13 of this document?

And these documents are described elsewhere as: (as read)

The 95th percentile monthly concentrations from an upper case modelling scenario.

That reference is on page 10 if anybody wants to look at it, but I don't think we need to go there.

These same concentrations also appear in CIAR 313 on PDF page 1310, which is a table of concentrations of contaminants of potential concern used in the human and wildlife health risk assessments.

So the question is: Could Benga confirm that Equation 7 on PDF page 174 that we previously looked at is for calculation of concentrations in surface water resulting from air deposition to a lake?

A MR. MITCHELL: I believe that is the -- sorry. Excuse me for a moment. Ian Mitchell here. I cannot hear what he says.

Mr. Chair, I believe that is accurate. I will just quickly confirm with the person that did those calculations. It'll just take me one moment here.

Q Sure.

A Yes. The short answer is: Yes, that equation is

related to the deposition from air to a lake.
Q Okay. So I think we're still on page 13 of CIAR 360. So could Benga confirm that the concentrations of contaminants of potential concern, including arsenic, used for the human health risk estimates are the ones presented in this table?
A Yes, I believe those -- that table incorporated not just the deposition from air but other sources as well.
Q Okay. So that kind of gets to my next question. Could Benga clarify whether the concentrations shown in Table 7.1-2 that we're looking at are a result of the combination of air deposition and waterborne pathways or if they are, instead, 95th percentile mean monthly concentrations produced by the SRK GoldSim water and load balance surface water quality model only without inclusion of air deposition?
A Give me one moment on that one.
Q Okay.
A So that includes the air deposition added to the -- the surface water calculations.
Q Okay. So let me carry on with a few follow-up questions. Could Benga confirm that if Benga's calculated surface water concentrations were, indeed, derived from the integrated air and surface pathways -- surface water pathways, the concentration in Table 7.1-2 logically would be greater than that for

the air or water pathways alone?
A That seems logical.
Q Okay. That doesn't necessarily seem to be the case, but we'll get back to that in a future question.
Were the calculations for contaminants of potential concern, other than fluoranthene and arsenic, checked for errors and required adjustments in input parameters -- sorry, checked for errors and required adjustments in input parameters, and if they were, were these errors corrected?
A So when the issue with arsenic was discovered, a check was done of all the other chemicals to make sure that all the inputs were correct for those as well, and other than the ones that were identified, no other issues were noted.
Q Okay. So no adjustments were required to any of the others?
A No.
Q Okay. So if we could go to CIAR 313. And we're starting with Table 7-1, which appears on PDF 1258. And there's a series of tables here: 7-1, 7-2, 7-3, and 7-4.
So the question is: Why are the hazard quotients for aluminum, cadmium, lead, manganese, and thallium identical or very close to identical for Blairmore Creek, Gold Creek, the Oldman reservoir, and the

end-pit lake, and the hazard quotients for cobalt within 0.01 of each other in all but the end-pit lake despite distinctly different concentrations of these contaminants of potential concern in the four receiving environments, as shown in these tables -- sorry, as shown in CIAR -- on PDF 1310?

A Again, just give me a moment to caucus. I wasn't very involved in the water calculations myself.

Q Sure. And if you need me to repeat any of the question, let me know.

A Okay. So it -- the hazards that were presented in those tables relate to the full multimedia assessment, so they -- it [sic] include not just the water but other exposure as well, and I think a lot of the hazards were actually driven by the vegetation ingestion as opposed to the water ingestion, which is why they're similar across the water bodies.

Q Okay. Thank you.

Sorry. I'm just waiting for my subject matter expert.

So my subject matter expert tells me that the water concentrations are higher than in vegetation. So why the identical hazard quotients?

A May need a moment more here, unless you want to come back to this one. Waiting to get an answer from the people that ran the multimedia model.

Q I can do either. If you want another moment, that's fine. If you want to carry on until they get back to you, that's also fine. What would you prefer?
A Give me one more minute to try to get some answers.
Q Okay.
A I think it would be better to move on, and we'll come back to this --
Q Okay.
A -- once I can get that --
Q Okay.
A -- information.
Q Okay. Thank you.

So the next set of questions relates to the level of conservatism used in the calculation of risk from exposure to concentrations of contaminants of potential concern in water. So I'm going to start by walking you through portions of Benga's evidence which are relevant for this topic, and we'll start with the predicted concentrations of contaminants of potential concern in Blairmore Creek and Gold Creek.

In CIAR 360, on page 8, Benga states that the risk assessment was based on the 95th percentile monthly water concentrations of the 23-year operations period and a 57-year postclosure period from the upper case model scenario. Benga states that the upper case model scenario for the GoldSim model used geochemical source

terms which were analogous to a boundary condition that is considered highly unlikely to be exceeded. Flow inputs to the GoldSim model were monthly averages.

In CIAR 313, on PDF page 250, in response to an -- to Information Request 6.25, Benga stated that updated hydrology and modelled concentrations of contaminants of potential concern was conducted for Gold Creek and Blairmore Creek in order to reflect seasonal variability in flow and the effects of climate change in the postclosure period. Benga provided detailed results of the modelling in Appendix 6.25 of CIAR 313.

Appendix 6.25 of CIAR 313 includes a series of figures of predicted concentrations of contaminants of potential concern. For example, mean monthly arsenic concentrations are shown in Figure 3 on PDF page 1170. The results of this figure indicate that the maximum modelled mean monthly arsenic concentration in Blairmore Creek is about 0.65 micrograms per litre. The concentrations of contaminants of potential concern used in the human and wildlife health risk assessments are presented in CIAR 313, PDF page 1310, which is Appendix A to Addendum 1.

THE CHAIR: Sorry. You can just leave that up, Zoom Host. Don't try and follow all of these.

Q THE CHAIR: The Panel is interested in further clarification regarding the level of

conservatism in the assumed concentration of contaminants of potential concern which were used to estimate risk to human health.

So could Benga confirm that the primary difference between the original GoldSim modelling and the updated modelling in CIAR 313 is the use of monthly hydrographs which incorporate climate change and that both models used upper case geochemical source terms?

A MR. HOUSTON: Just -- we'll need one minute on that, Mr. Chair.

Q Sure.

A MS. MOONEY: Hello, Mr. Chairman. Lindsey Mooney here.

Q Yeah.

A So I'm aware that an older data set was presented in Appendix A that you have -- that's shown on the screen now for Blairmore Creek and Gold Creek. Notably, the concentrations for Blairmore Creek increased. We reevaluated with this updated data set. For eco we rescreened. It didn't change the conclusions -- the exposure ratios for eco. They went up very slightly, but there were no changes to conclusions. And the values that we have run in that reevaluation were the 95th percentile of the upper case for Gold Creek.

I don't know if that answers part of your question, maybe.

Q Well, it anticipated where I was going with some of the questions. But a couple comments. We're currently asking questions about the human health risk assessment and the -- seems to be a different set of chemicals of potential concern in the health risk than for eco risk, so I'm not sure that answer totally addresses the question.

The question I just asked was really about the difference between the GoldSim modelling and the updated modelling, but I am kind of headed towards what you anticipated, which is: Was the updated modelling used in both the wildlife health and human health risk assessments? That's kind of where I'm headed with my questions.

So I think what I heard you tell me is that it was used in the wildlife health risk assessment --

A So --

Q -- the updated modelling?

A -- the updated -- what is presented in the most recent version is relying on the concentrations that are shown on the screen at the moment for eco. We recognized that that was on older data set and reevaluated with the updated data set, and it made a marginal change to exposure ratio and no change to conclusions.

For -- for human, I'll let -- I'll let Ian speak to that.

A MR. MITCHELL: Yeah. I don't believe the human health numbers were rerun afterwards, but similar to the wildlife, our expected results would be, you know, fairly small changes in -- in the risk levels and no -- no really anticipated changes in the conclusions.

Q Okay. So it wasn't -- it wasn't used for the human health assessment?

A No, I don't believe the human health numbers were updated after that.

Q Okay. I'm going to carry on with my questions just to probe this issue a bit more. But, Ms. Mooney, to go back to your point, the updated calculations were not provided in any of Benga's submissions?

A MS. MOONEY: That's correct.

Q Okay. So we might be looking for an undertaking to provide those, but I'll circle back to that a little farther on.

Okay. So just kind of carrying on with this line of questioning, then, and, again, this is specific to the health risk assessment at this point, but could Benga explain the apparent discrepancies between the concentrations of contaminants of potential concern in Blairmore Creek used for the human health risk assessment as summarized by CIAR 313 on PDF page 1310 and the results of the modelled mean monthly concentrations in the creek presented in CIAR 313,

Appendix 6.25-1, Figures 1 to 54, with emphasis on issues where the concentrations used in the risk assessment are lower than what would be surmised as the likely 95th percentiles from the modelling results in Appendix 6.25-1? And so examples of this would be arsenic, copper, manganese, nickel, nitrite, silver, sulphate, and zinc concentrations in Blairmore Creek.

And I realize there's quite a few figures that I referenced there. There's 54 in total for each of the COPs. So I'm going to just give you an example to make it clear what the concern is and what we're talking about.

So if you -- if we turn to CIAR 313, page 1170. So this is an example of one of the figures. And according to Appendix A, Benga used an arsenic concentration of 0.437 micrograms per litre in Blairmore Creek for the assessment. This concentration is lower than the maximum mean monthly arsenic concentration of what appears to be about 0.65 micrograms per litre illustrated in this figure.

So in similar -- our inability to reconcile the use of 95th percentile concentrations from the figures with the human health risk assessment occurs for other parameters. And, Mr. Mitchell, I think you've acknowledged that the human health assessment was not updated to reflect the more recent modelling, so that

perhaps explains some of the issues?

A MR. MITCHELL: Yeah. That's my understanding, is that the -- the modelling was updated and the concentrations were updated, but the human health risk assessment hasn't been updated since then.

Q Okay. So I'm just waiting on a message from my subject matter expert.

So one of the concerns the Panel has about not using the updated model results relates to arsenic because the incremental cancer risk using the old model was already 2.7 times the Health Canada target for incremental lifetime cancer risk, and if it has increased more, it may be even more -- even higher than that. So that's a potential concern. And that was specific to the end-pit lake.

So given some of the issues we've just talked about, so the identical hazard quotients for several contaminants of potential concern despite distinctly different concentrations in water, the current question we've just been talking about about the potential lack of conservatism in the concentrations of the COPs that were used in the water pathway, the Panel is wondering if Benga could provide an updated summary table of the recalculated hazard quotients for the contaminants of potential concern which have identical or near identical hazard quotients approaching or greater

than 1. So that would include aluminum, cadmium, cobalt, lead, manganese, thallium, zinc, and vanadium, as well as arsenic.

And in doing so, would Benga use the application case concentrations predicted by the updated modelling presented in CIAR Appendix 6.25-1 and ensure that both air deposition to the modelled water concentrations is included to produce the total concentrations?

And I guess, although I wasn't specifically talking about the wildlife health risk assessment at this point, if updated hazard quotients were not provided in any of Benga's submissions based on the updated water modelling, we would like a summary table of those as well.

A MR. HOUSTON: Can we just have a moment, Mr. Chair?

Q Sure.

A So, Mr. Chair, we've discussed what you've asked for, and I -- I think it's clear that some of the numbers used in the analyses are pulled from different points in time. The -- both the human health risk assessment and the wildlife risk assessment are based on very conservative assumptions in terms of consumptive habits, i.e., we've assumed that the individual or the animal involved is exclusively sourcing food or air from -- from the same location for an extended period

of time, which, of -- of course, is -- is very conservative.

We can rerun the models based on a -- that the -- the numbers in 6.25 -- the response to 6.25, but it's not going to be a quick -- it's not going to be a quick process that -- the rerunning of the models takes considerable effort and time. And so I -- I'm not quite sure how to deal with that.

What -- what we can say is that, you know, we're very confident that with all the conservatism built in the model that the results will not change, but we recognize the Panel's desire to have a consistent set of numbers based on the last hydraulic model results.

So I'm not sure -- we're willing to do the work, but I think it's unreasonable to expect that the revised numbers would be available within the next few days. It would be more likely January, that -- that kind of time frame.

Q So the issue for the Panel is not so much the other conservative functions; it's really about -- it appears to us that the updated water modelling was not used in the assessment. It appears that the numbers are higher. So it's not clear to us how conservative the assessment is without kind of having the most recent updated numbers.

A M-hm.

Q So it makes it difficult for the Panel to assess that. And, you know, I think the Panel would agree that for some parameters that are -- you know, where the hazard quotient is well below .2 or 1, you know, we're not so concerned about those. It's the parameters where the hazard quotient is within that range of, you know, .2 to 1, and if we were to increase further, does that have implications for the assessment of risk to health? That's the, kind of, Panel's concern.

A M-hm. Yeah. Understood. I -- I -- I think it -- I agree with you. It would be clearer for everybody if we had one consistent set of numbers that were run through to the end. The -- yeah. The running of the models just takes time. That's -- that's the -- that's the only concern we have.

Q Okay. Let's maybe park that momentarily, and I'll confer with my colleagues at the break.

A Okay.

Q But just flag that this -- we do see this as an issue in terms of our ability to interpret the human health risk assessment.

A Okay.

Q Okay. I'm going to carry on, then, with the next one.

So now I'd like to turn to the level of conservatism in the derivation of concentrations of contaminants of potential concern in the Oldman

reservoir. So in CIAR 360, PDF 8, Benga states: (as read)

> The risk assessment was based on the 95th percentile monthly water -- monthly water concentrations of the 23-year operations period and a 57-year postclosure period from the upper case model scenario.

Could Benga confirm that the concentrations in the Oldman reservoir in Appendix A to Addendum 1 of CIAR 313, which were used in the estimate of risk to human health, were produced by the GoldSim model described in CIAR 42, Appendix 10? So, again, we're thinking about the human health risk assessment here, and this is not unrelated to the discussion we just had.

A So -- so, Mr. Chair, I believe we discussed this during the water panel, and those concentrations in the Oldman reservoir were, indeed, generated through the GoldSim model.

Q Okay. Thank you.

So given the discussion we've just had with respect to the level of conservatism in the GoldSim model compared to the updated model for Blairmore and Gold Creeks, and given that the project-related loading of the COPCs to the Oldman reservoir is from Blairmore and Gold Creeks, will the use of the updated model

results for Blairmore and Gold Creeks presented in CIAR 313, Appendix 6.25 change the predicted concentrations of contaminants of potential concern in the Oldman reservoir, and, if so, by how much?

A Mr. Chair, the -- the revised modelling of Blairmore and Gold Creek and the modelling for the Oldman reservoir concentrations were done at the same time; in -- in other words, the -- the model was -- the GoldSim model was revised to produce the outputs for 6.25 and, at the same time, are -- are using the same values -- the estimations for the Oldman reservoir were -- were done. So I'm -- I'm saying it's -- it's the same model.

Q Okay. Just a moment.

Okay. Thanks.

So what is Benga's confidence that the predicted concentrations of contaminants of potential concern in the Oldman reservoir reflect hydrologic variability and climate change and are conservative?

A I -- I wish you had asked that question a week ago, Mr. Chair.

Q M-hm.

A It's really a question for Soren Jensen, who did the modelling. However, I -- I think the response he would give is that the seasonal variability that we -- we noted in our model was based on -- I -- I call it a

"Monte Carlo", but it's a -- it's a modelling technique that -- that looks at dry years, wet years, and -- and looks at the natural range of variability and inflows, and over the life of the project, we -- we would expect that that would encompass the marginal changes due to climate change.

Q Okay. Thanks for that, Mr. Houston.

Okay. I'm going to shift gears a little bit and ask some questions about predictions of concentration of contaminants of potential concern in the end-pit lake. There are several references related to the derivation of concentrations of selenium and other contaminants of potential concern in the end-pit lake.

In CIAR 42, Consultant Report 5, Benga states that: (as read)

> The concentrations of contaminants of potential concern in the end-pit lake were derived using data collected from three historic pit lakes.

That reference is on PDF page 58. And Benga presents these historic pit lake concentrations in Table 13 on PDF page 61.

These concentrations are for winter only and range from 0.23 to 1.79 micrograms per litre. No details were provided with respect to how predicted concentrations in the end-pit lake were derived using

the historic pit lake data.

In CIAR 42, Appendix 10, Figure 7-16 to 7-20 on PDF pages 269 to 271, Benga presents sulphate, nitrate, cobalt, selenium, and zinc concentrations in the end-pit lake for the duration of the modelling period. There were no predicted concentrations of other contaminants of potential concern in the end-pit lake in Appendix 10B.

Benga presents the concentrations used for the assessment of risk to human health and wildlife health, including estimated concentrations in the end-pit lake in CIAR 313, Appendix A to Addendum 1, PDF page 1310. Some example concentrations of COPs in the Appendix A table include a selenium concentration of 30 micrograms per litre, and sulphate concentration of 190 milligrams per litre, and nitrate concentration of 0.107 milligrams per litre, a cobalt concentration of 0.045 milligrams per litre, and a zinc concentration of 0.177 milligrams per litre.

Could Benga confirm the basis for prediction of the concentrations of contaminants of potential concern in the end-pit lake? Specifically what we're interested in is knowing if historic pit lake data were used and, if so, how they were used, and if modelling was used, whether the GoldSim modelling reported in CIAR 42, Appendix 10B was the basis for all of the

concentrations presented in CIAR 313, Appendix A, or whether another model was used.

A Just one minute, Mr. Chair.

Q Thank you.

A So -- so, Mr. Chair, the -- the estimates in Document Number 313, the most recent ones, were made using the GoldSim model, and they were made using the upper case values, so values that are boundary case. The intent of that exercise was to provide a screening-level assessment of -- of risk to -- to wildlife. And so our -- our interest was in generating numbers that were on the high end.

The modelling is not based on design of the end-pit lake. It's based on some assumptions around what the end -- end-pit lake might look like. And the idea was to identify where there is a potential risk to inform the future design of the end-pit lake and -- and any mitigation measures that need to be incorporated into that design.

Q Okay. Thank you, Mr. Houston. Just one minute.

Are you able to tell us whether or not the GoldSim modelling of the end-pit lake considered varying volumes of the lake with an emphasis on, kind of, dry/wet years?

A The current -- current thinking is that the end-pit lake, as we've discussed, will -- will maintain a

fairly steady volume because it will be designed to decant into the saturated backfill zone. I don't believe we've allowed for the end-pit lake to decrease in volume below that kind of maintenance elevation in -- in our modelling.

Q Okay. Thank you, Mr. Houston. One minute.

So can Benga provide and discuss the various conservative assumptions used in the prediction of end-pit lake water quality?

A So, Mr. Chair, that -- that would primarily relate to the use of the upper case source terms and a presumption around the ability of -- or the incoming water to contain -- to -- to have been in contact with -- with rock that is leaching the contaminants of concern. So some -- some high-level assumptions were made on both of those -- in both of those cases. I -- I'm -- it's most easy to talk about the -- the upper case, that -- that being the highly unlikely case in terms of leaching values. In terms of how much water going into the end-pit lake is exposed to rock that has the potential to leach, I'm -- I'm less able to talk to that. But I -- I could reach out to Mr. Jensen to get a little bit more background on -- on that, if that is helpful.

Q So just to confirm what I think I heard you said, that the 95th percentile values were really related to the

geochemistry source terms, that those 95th percentile values are not related to the hydrology because you assumed that the lake would have, kind of, a constant volume. Do I have that correct?

A That's correct. And there would also be an assumption around how much of the water that arrives in the end-pit lake is subject to -- is exposed to rock that could leach the chemicals of potential concern and how much arrives directly as overland runoff.

Q Okay.

A All -- all of those things are based on a design that hasn't really happened yet as well, Mr. Chair. So there -- there's a lot of -- lot of assumptions in -- in the model. And as we highlighted, the intent was to derive values that, you know, are conservative so that we could identify which chemicals of potential concern present risk and -- and use that as an input into the final end-pit lake design.

Q Okay. So given your answer with respect to the conservatism inherent in the derivation of concentrations of COPs in the end-pit lake, can you explain or justify why Benga considers the incremental lifetime cancer risk from arsenic exposure of 2.7 in 10,000, which is 27 times the Health Canada target of 1 in 100,000 to be conservative?

A MR. MITCHELL: There is a couple aspects

with -- with arsenic, and what -- one of those is a certain amount of conservatism built into that toxicity value to -- to -- to start with. The -- it's based on the assumption that there's basically a linear relationship between concentration and cancer risk. And there are quite a few researchers in the arsenic world that actually don't believe that's the case and there is actually a threshold below which those risks don't occur. But, you know, in the absence of conclusive information and, you know, regulatory acceptance, we -- we sort of work on that assumption.

The second is that the background risks on the -- on the -- or the background concentrations of arsenic are already sort of in that 10 to the minus 4 range. Again, background concentrations of arsenic in water and food are already at that kind of level. So I believe there is a discussion of that. Just let me find the right place. So in CIAR 313 -- I'll pull that one up myself -- page 1063 PDF, I believe there is a discussion of that. Sorry. That doesn't look like the right PDF page. Just give me a moment to find where that is.

A MR. HOUSTON: Mr. Mitchell, you might want to look at Document 360, PDF 11.

A MR. MITCHELL: Thanks, Mr. Houston.

So -- so we do have a discussion of that issue

in -- in our report, and as there are quite a few locations, the risk -- the predicted risk was less than 1 times 10 to the minus 5. Again, a lot of these concentrations, either where a risk above 1 times 10 to the minus 5 is predicted, the concentrations were actually below the drinking water guidelines, and that also base -- is built on some conservative assumptions that include that, you know, essentially, 100 percent of somebody's drinking water over their lifetime comes from that source, which, again, we believe, particularly for a source such as the end-pit lake, is an extremely conservative assumption.

Q Okay. Thank you, Mr. Mitchell.

Moving on to another question. In CIAR 313, Tables 7-1 to 7-4, which appear on pages 1259 to 1263, Benga presents hazard quotients and incremental lifetime cancer risks for the end-pit lake, Blairmore Creek, Gold Creek, and the Oldman reservoir. Hazard quotients greater than the target -- greater than the target HQ of 0.2 were noted for several contaminants of potential concern, including aluminum, barium, cadmium, cobalt, copper, lead, manganese, methylmercury, selenium, thallium, and zinc.

Benga then makes several statements with respect to the contribution of background concentrations of the COPCs which exceed an HQ of 0.2. On PDF page 1264 of

CIAR 313, last paragraph, Benga states that: (as read)

> Due to low inherent toxicity of aluminum and the fact that measured concentrations are consistent with what would be expected to naturally occur in the background, aluminum is not considered to be a human health concern for the project.

On PDF page 1265, Section 7.2.1.2 of CIAR 313, Benga states that: (as read)

> Antimony HQ results are driven primarily through background exposure estimates which are considered an artifact of the conservatism built into the human health exposure model.

On PDF page 1265, Section 7.2.1.3 of CIAR 313, Benga states that: (as read)

> The HQ values for barium, cadmium, copper, lead, manganese, thallium, and zinc are a result of background measured concentrations and that in all cases project-case contribution predictions were less than 0.2. [Benga goes on to state that] The additional consideration of groundwater contribution to the human health risk model has had no material effects on the conclusions of the updated human health risk assessment.

In CIAR 313, Appendix A, PDF 1310, background and project-related concentrations of the contaminants of potential concern used in the risk assessment are presented.

So the question is: Can Benga explain why project-related concentrations of the contaminants of potential concern with hazard quotients greater than 0.2 for exposure to Blairmore Creek in the application case are an order of magnitude above background for all but zinc despite Benga's statements which attribute hazard quotients greater than 0.2 to background exposure?

A Sorry. Could you repeat that question?

Q Sure. Can Benga explain why project-related concentrations of the contaminants of potential concern with hazard quotients greater than 0.2 for exposure to Blairmore Creek in the application case are an order of magnitude above background for all but zinc, despite Benga's statements which attribute hazard quotients greater than 0.2 to background exposure?

A Again, that relates to, Mr. Chair, the exposures and hazards that were calculated for the full multimedia model. So those concentrations in the last table you referenced are just the surface water concentration, but where those hazards are actually coming from is -- is the rest of the multimedia assessment and, in

particular, the exposure through vegetation.
Q Okay. Just a moment.
So in that case, could you provide an explanation for a specific example? And so I'm thinking about lead. So you're suggesting that vegetation rather than drinking water is deriving -- is deriving those concentrations? And would that apply to something like lead?
A Yes, that's correct.
Q Okay. Thank you, Mr. Mitchell.
A We can't confirm specifically about lead, but in -- in general, that is the trend. We'd have to look at the detailed modelling results to talk about a specific chemical. But I could certainly ask the team to do that for lead.
Q No, that's fine, Mr. Mitchell. I think that's satisfactory.
So given that the relative contribution of the project to the hazard quotients in that multimedia assessment is greater than 0.2, what mitigation measures does Benga think are appropriate to reduce its contribution to risk to human health from these contaminants of potential concern? Or maybe a better way to ask it is: What mitigation measures, if any, has Benga proposed to reduce its contribution to incremental risk from these contaminants of concern?

A MR. HOUSTON: One minute, Mr. Chair.

So, Mr. Chair, the mitigations are primarily related to the things we've been talking about in terms of air -- air contaminant reduction and treatment of water through the water management system of the project. Those are the primary mitigations.

When it comes to the end-pit lake, of course, we -- we still have a detailed design process to go through, and as we -- as we do that, that detailed design will be informed by learnings through the first years of operation and water treatment in terms of source -- source terms, in terms of our -- our ability to treat, and -- and especially, as we develop the mine plan in more detail, the -- the configuration of the end-pit lake. So there are mitigations to -- to come with respect to the end-pit lake. With respect to water that may be in Gold Creek or Blairmore Creek, we've talked extensively about the capture and treatment programs that we have put in place for the project or proposed for the project. And in terms of air contaminants, we've talked extensively about our modelling of contaminants of concern through the air models.

Does that answer your question, Mr. Chair?

Q It does.

Maybe just one follow-up with regard to that.

Would Benga expect to have to restrict access to the end-pit lake for a prolonged period into the postclosure phase to manage the potential for exposure to human health?

A Certainly that wouldn't be our objective as we go through the design, Mr. Chair, and -- and -- and we'd be looking for mitigations and alternatives through that end-pit lake design to avoid that -- that kind of mitigation, the -- the -- the restricted access -- need for restricted access.

However, I think we do recognize that there may be a situation where the initial filling of the end-pit lake could -- could result in water quality that is not what we would like and the potential to have to take some post-filling measures to -- to treat the water down to a -- a sustainable and -- and acceptable water quality. So there may be some temporary measures required in terms of restricted access.

Q Okay. Thank you, Mr. Houston.

Okay. I'm going to shift gears a little bit here and talk -- ask some questions about the groundwater pathway. So human consumption of groundwater by way of a domestic use water well was not considered as a component of the human health risk assessment update provided in CIAR 313, Appendix 6.27-1, Addendum 1. Benga stated: (as read)

There are no confirmed domestic wells within the proposed mine permit boundary and the potential for domestic wells to be drilled and completed within the mine permit boundary is low because the underlying bedrock units are not very permeable. Surficial deposits associated with Gold Creek or Blairmore Creek were identified as the primary unit to be considered regarding domestic water wells; however, Benga stated that groundwater quality in those aquifers would be similar to the quality of the associated surface water. Benga's baseline groundwater data indicates some exceedances of drinking water guidelines for aluminum, barium, chromium, iron, and manganese in samples of groundwater taken from surficial deposits; shallow, mid-depth, and deep-monitoring wells; springs and groundwater-dependent ponds in the local and regional study area.

THE CHAIR: So, Zoom Host, if you could pull up CIAR 42, Consultant's Report Number 3. And I'm interested in Table B8, which appears on PDF 137 and 138. So we'll start with 137.

Q THE CHAIR: So I just want to, first of all, draw Benga's attention to the concentrations of

aluminum and manganese in the samples from surficial deposits from the well MW15-12-7 which appears near the bottom of page 137. The geology of MW15-12-7 is described as "surficial deposits" in CIAR 42, Consultant's Report Number 3, PDF page 194.

And if we can turn to the next page, one page down, 138. If Benga could then also look at the concentrations for the springs which appear, and, again, particularly aluminum and manganese. And then if Benga could compare these values to the predicted concentrations in surface water bodies considered in the human health risk assessment, CIAR 313, PDF page 1310. And maybe we can pull that up.

So the question is: Could Benga confirm that the aluminum concentrations used in the risk assessment for Blairmore and Gold Creeks which range from 0.005 to 0.03 milligrams per litre do not reflect the range of aluminum concentrations from the well in surficial deposits with the site location code MW15-12-7, which had a concentration of 8.83 milligrams per litre or the two concentrations measured in Spring 1, which were 0.11 and 0.14 milligrams per litre?

A MR. HOUSTON: So, Mr. Chair, if I understand the question, you're asking us to confirm that the -- the table in -- I think this came from 313, the one that's on the screen now, does not reflect the values

from Consultant Report Number 3 in those wells and springs that you identified? Do you --

Q That's correct, yeah.

A Just -- just one minute.

That -- that -- that's correct, Mr. Chair. The -- the human health and wildlife health models are -- are reflecting values that are representative of -- of -- of a larger spatial area and do not necessarily reflect specific samples that are taken from -- from the wells that were identified in Consultant Report Number 3.

Q Okay. Thank you, Mr. Houston. Just a similar question, then, for manganese. Could you confirm that the manganese concentrations used in the risk assessment, which range from 0.005 to 0.03 milligrams per litre -- oh, sorry. I might be reading the same question again. No, I'm not. Sorry. I'm going to start again.

Could you confirm that the manganese concentrations used in the risk assessment, which range from 0.005 to 0.03 milligrams per litre, do not reflect the range of manganese concentrations from the spring samples which range from less than 0.005 to 2.69 milligrams per litre?

A That -- that is correct, Mr. Chair.

Q Okay. So could Benga then comment on the potential for risk to human health from drinking water obtained from

surficial deposits in springs given the above results and given that the surface water concentrations in the two creeks do not reflect the range of groundwater quality in surficial deposits?

A MR. MITCHELL: A couple of things, Mr. Chair. One is, obviously, when you're looking at individual samples for manganese, for example, you -- you've done that at a range of, you know, less than .005 up to 2.61, so it does vary both, you know, spatially and over time. And I -- I can't speak to how those samples were collected and whether they were filtered or not. I wasn't involved at all in the hydrogeology assessment.

But, also, a lot of those drinking water guidelines, for example, for -- and I don't have the -- the supporting documents in front of me, but for manganese, I'm pretty sure, off the top of my head, it's actually not based on a -- on a human health end point. So I could be wrong. That's just off the top of my head. But -- so -- so, again, these concentrations that have been measured in -- in these baseline samples don't necessarily indicate a human health risk even if they do exceed the drinking guidelines.

Q Okay. Thank you, Mr. Mitchell. Just one moment.

If one were to drink water from a well or a spring

in the location that had those concentrations that were identified in Table B8, would there potentially be a risk to human health given that the concentrations are well -- well above --

A MR. HOUSTON: And to be clear --

Q -- (INDISCERNIBLE - OVERLAPPING SPEAKERS)

A Sorry, Mr. Chair.

To be clear, you're -- you're -- you're talking about an occasional drink of water, or you're talking about a lifetime supply from -- from those locations? I think you're talking about an occasional drink as opposed to a long-term usage of the water.

Q Potentially, I suppose. I'm going to ask you a question about Ms. Gilmar shortly that might fall into a category. But however you want to answer it, temporary --

A Okay.

Q -- or long-term.

A Okay. And that was specifically around aluminum and manganese; right?

Q Yeah.

A Okay. So, Mr. Mitchell, do you have --

A MR. MITCHELL: Yeah.

A MR. HOUSTON: -- a response?

A MR. MITCHELL: Could you potentially call up the table that actually had those numbers in it again?

Q Okay. Let me just back up a bit here. Sorry. I'm just trying to find the right reference.

THE CHAIR: CIAR 42, Consultant Report Number 3, PDF 137, and then 138 as well, but let's look at 137 first. Scroll to the bottom of that.

A MR. MITCHELL: So those concentrations, you know, they were -- the ones that really get flagged are, again, the aluminum, see some pyrene in some locations, be some -- some manganese, that are primarily based on aesthetic objectives. Again, I think the -- the manganese in particular, I know, is based on aesthetic objective. Aluminum and iron, we see high concentrations in groundwater all the time for -- for various reasons. And, again, not a lot of really stringent health -- health end points on those, and, you know, without having done a formal assessment on these particular groundwater sampling locations, the -- the numbers don't raise a whole lot of concern to me. And I think if -- concentrations in the actual springs, I think, were a bit lower, if I recall, on the next page.

Q Yeah, if you go to one -- next page.

A Yeah. So, again, in the springs, we see that manganese again that's above an aesthetic objective. And, again, I don't have the supporting document in -- in front of me. Just from the -- recollection, I think it might be

related to -- something related to -- to laundry stains or something like that, but don't -- I -- I can't say that for sure because I don't have that document in front of me.

Again, one sample with some low iron that we see, again, quite often. And, again, I don't know whether these samples have been filtered or whether that reflects a -- a total concentration or not. But those sort of numbers don't give me a whole lot of concern.

Q Okay. My risk assessment expert tells me that the aluminum objective is not based on esthetics only and that at higher concentrations, there may be a risk. Are these the kind of levels you would be concerned about?

A It -- it depends on whether -- whether the -- whether that's reflecting a dissolved concentration or a total concentration. Again, I don't know the background around these numbers. It's slightly above the -- the drinking water guideline within the same general magnitude. It's -- you're probably not a yield drinking water source, if it's -- if it's above that, but I -- I can't, without actually doing a proper assessment on it, you know, confirm what the level of health risk is.

Q Okay. I think that's -- that's good enough. I'm going to move on to the next question.

Is it possible that seepage from waste rock areas could affect groundwater in surficial deposits, springs, and bedrock deposits resulting in increases in concentrations of contaminants of potential concern, notably selenium but also other metals such as aluminum and manganese?

A MR. HOUSTON: So we have put in place a groundwater monitoring program, and we've identified that we're going to be monitoring water adjacent to the -- the ex-pit rock dumps and other structures and also adjacent to the -- the -- the creeks. And the idea would be to identify any -- any levels of contamination that are concerning and to use that to inform additional mitigation measures. So our -- our -- our plan would be to -- to -- to mitigate to avoid that situation.

Q Okay. Thank you, Mr. Houston.

Does Benga expect that people will not use water from surface -- surficial deposits or bedrock in the postclosure period, and if so, what's the basis for that opinion?

A So we -- we -- again, we expect that mitigation measures will be in place as required postclosure to ensure that water quality is -- is adequate in -- in the vicinity of the -- the creeks. We -- in terms of postclosure of the mine site itself, I would expect

that we would have to deal with that based on -- based on the final circumstance of the site.

We -- we do expect to have to treat through the saturated backfill zone, for example, for an extended period of time, as we've discussed, and so within the -- the area of the mine pit itself, yes, we -- we would not expect to have folks drilling wells or doing something else that would disrupt that area.

Outside of that, we would continue with our -- our water monitoring program and continue with mitigation measures required to ensure that groundwater outside of the -- the mine site itself remains at acceptable quality standards.

Q Okay. Thank you, Mr. Houston.

So we heard during the first week of the hearing that Fran Gilmar, whose lands are located on the east side of the project and within the currently proposed mine permit boundary, uses a spring on her property as a source of drinking water, and we heard other property owners on the east side of the project, across the creek may also use springs as a source of drinking water.

Has this been considered within Benga's human health risk assessment, and if not, why not?

A Maybe I'll just start on that, Mr. Chair, and then we can -- we can let Mr. Mitchell add on, if -- if he

will -- if he wishes.

The -- the springs that Ms. Gilmar is talking about are points where seepage surfaces very close -- in very close proximity to Gold Creek. And so we -- we would consider those to be essentially part of the base flow going into Gold Creek. We -- we do -- we will continue to monitor that -- that base flow for water quality, and we will continue to monitor at other points closer to the -- to the mine to ensure that the water is -- is of suitable quality, essentially, a quality that's suitable for entering into the creek itself.

Mr. Mitchell, is there anything to add to that?

A MR. MITCHELL: I -- I think you captured it fairly well, Mr. Houston.

We -- we did assess, based on the drinking water and based on the -- out of -- out of the -- the streams and the assumption that that would essentially provide a permanent, you know, long -- long-term drinking water supply for somebody, which I don't know how -- I don't know how these springs are used, but, you know, if the springs are associated with a surface water, then we would expect the risk to be generally similar.

Q Okay. Just a moment, please.

So just for clarity, then, Fran Gilmar's spring that she uses wasn't explicitly considered within the

human health risk assessment?

A No. I don't think we had any information about that when we were doing the human health risk assessment. So it wasn't explicitly considered separately from the surface water. Again, we did also assume a lifetime exposure there, and I -- my understanding is that that's not a full-time drinking water source.

Q Okay. Thank you, Mr. Mitchell. Just one moment.

If the project did result in elevated concentrations within groundwater, what are the mechanisms that would cause the project-related concentrations to diminish with time, and how much time would be needed to return to something resembling baseline?

A MR. HOUSTON: Of course, that's a question we've tried to wrestle with a few times during this -- this hearing, Mr. Chair, and the -- the mechanisms for long-term reduction of seepage in -- into -- or into the water, whether it be groundwater or water that we extract from the ex-pit dumps, is -- is difficult to prescribe with any -- any precision.

We do hope to -- through the reclamation, through the structure of the dumps, through other mitigations to minimize the amount of water that is -- that -- that percolates through the -- the ex-pit dumps in -- in the first place and -- and then escapes to groundwater, and

we do anticipate operating seepage capture wells adjacent to those facilities for some time.

The -- the time frame to predict that the -- the ambient concentrations reduce below acceptable levels is -- is just something we -- we are not confident in -- in predicting at this moment, and so the best we can do there is to indicate that we will commit to maintaining all of those mitigations for -- for the long -- long term until they're no longer required.

Q Okay. Thank you, Mr. Houston.

So just a final question on this topic. So having regard for that discussion, what is Benga's level of confidence that drinking water obtained from groundwater sources would not be affected by the project, including during the postclosure period?

A So the groundwater source is bounded by Gold Creek and Blairmore Creek on either side of the project and -- and Bluff Mountain in the -- in the south. Within those confines, we will be monitoring and testing groundwater quality, and we will have, as I've just mentioned, mitigation in place to capture that groundwater that does not meet drinking water -- or -- or groundwater quality parameters.

So based on those factors, we have a high confidence that there won't be users of groundwater within the confines of the project that would be

exposed to a -- a health risk.

Q Okay. And just a moment, Mr. Houston.

Is your high confidence driven by your ability to control the source and capture contaminants, or is it based on monitoring?

A Both, Mr. Chair. We would be monitoring to ensure that the controls we put in place are -- are functioning properly and -- and to inform any additional mitigation measures that may be required.

Q Okay. Thank you, Mr. Houston.

THE CHAIR: I do have more questions, but I'm going to suggest we take our lunch break now. It's just about 12:15, so we'll resume at 1 PM. Thank you.

PROCEEDINGS ADJOURNED UNTIL 1:00 PM

Proceedings Taken via Remote Video

November 30, 2020 Afternoon Session

A. Bolton	The Chair
D. O'Gorman	Hearing Commissioner
H. Matthews	Hearing Commissioner
M. LaCasse	AER Counsel
B. Kapel Holden	AER Counsel
K. Lambrecht, QC	Joint Review Panel Secretariat Counsel
T. Utting	IAAC Staff
E. Arruda	AER Staff
D. Campbell	AER Staff
T. Turner	AER Staff
T. Wheaton	AER Staff
A. Shukalkina	AER Staff
M. Ignasiak C. Brinker	For Benga Mining Limited
R. Warden T. Howard	For Ktunaxa Nation

K. Poitras	For Métis Nation of Alberta Region 3
Chief B. Cote	For Shuswap Indian Band
B. Snow	For Stoney Nakoda Nations
R. Drummond S. McHugh	For Government of Canada
A. Gulamhusein	For Municipality of Crowsnest Pass
M. Niven, QC R. Barata J. Nijjer (Student-at-Law)	For MD of Ranchland No. 66
B. McGillivray	For Town of Pincher Creek
D. Yewchuk	For Canadian Parks and Wilderness Society, Southern Alberta Chapter
R. Secord I. Okoye	For Coalition of Alberta Wilderness Association, Grassy Mountain Group, Berdina Farms

		Ltd., Donkersgoed Feeder Limited, Sun Cured Alfalfa Cubes Inc., and Vern Emard
	R. Cooke	For Crowsnest Conservation Society
	G. Fitch, QC C. Agudelo	For Livingstone Landowners Group
	M. Sawyer	For Timberwolf Wilderness Society and Mike Judd
	(No Counsel)	For Barbara Janusz
	(No Counsel)	For Jim Rennie
	S. Elmeligi A. Morehouse S. Milligan M. Boyce	For Alberta Chapter of the Wildlife Society and the Canadian Section of the Wilderness Society
	J. Gourlay-Vallance	For Eco-Elders for Climate Action
	L. Peterson	For Trout Unlimited Canada

R. Campbell	For Coal Association of Canada
(No Counsel)	For Alistair Des Moulins
(No Counsel)	For David McIntyre
(No Counsel)	For Fred Bradley
(No Counsel)	For Gail Des Moulins
(No Counsel)	For Ken Allred
(Not Present)	
(No Counsel)	For Monica Field
S. Frank	For Oldman Watershed Council
A. Hurly	
C. Longacre, RPR, CSR(A)	Official Court Reporter

(PROCEEDINGS COMMENCED AT 1:02 PM)

GARY HOUSTON, MIKE BARTLETT, RANDY RUDOLPH, JANET BAUMAN, DANE MCCOY, STEVE BILAWCHUK, IAN MITCHELL, JOHN KANSAS, LINDSEY MOONEY, DAVID DEFOREST,

Previously Affirmed

(Dust, air quality, greenhouse gas emissions, noise,

and light; wildlife, including migratory birds and species at risk, wildlife health, and human health risk assessment)

Alberta Energy Regulator Panel Questions Benga Mining Limited

Q THE CHAIR: Okay. Welcome back, everyone.

Before moving on to my next set of questions, I just wanted to kind of revisit that issue -- or that discussion we were having about the fact that the health risk assessment was not updated to include the updated water quality modelling, and I had kind of put a potential undertaking to you, and I think what I heard was it would require a significant amount of effort and work to do that, so --

A MR. HOUSTON: Mr. Chair.

Q Yeah. Yeah?

A So we -- we've also been discussing that during -- during the lunch break, and I -- I think Mr. Mitchell, perhaps, has another pathway that we'd like to suggest --

Q Okay.

A -- for your consideration.

Q Sure. Go ahead, Mr. Mitchell.

A MR. MITCHELL: Yeah. So we took a look at the updated predictions for Blairmore Creek, and what we found is that almost all of those concentrations, at

least for the -- sort of the key contaminants that we were really looking at, were higher in the end-pit lake than they are in the revised Blairmore Creek numbers. So the risk predictions that were done for the end-pit lake are, therefore, you know, protective of Blairmore Creek.

So what we would propose is using those end-pit lake results to demonstrate kind of the -- you know, the worst-case for Blair Creek -- Blairmore Creek that we know -- we know Blairmore Creek will be lower than that. And, you know, again, we also do want to stress that these calculations are all based on these water bodies being a -- you know, sole source of water for somebody over a chronic period of time or -- or a lifetime. So there's that conservatism built in. But we did determine that the end-pit lake results are protective of Blairmore.

Q Okay. Just hold on a second.

So in thinking about that, did you look at the concentrations of the different COPCs, and can you confirm that all of the end-pit lake concentrations were greater than the concentrations in Blairmore Creek --

A Right.

Q -- for those that exceeded an HQ of 0.2?

A Not -- not all. There were a small number, and --

and -- and -- of the ones that came up of note, I think the -- the exception was aluminum, which I think had a concentration that was slightly higher in Blairmore Creek than predicted in the end-put -- pit lake. You know, if the Panel did want an updated result for aluminum, I -- I think we could probably have that available for, perhaps, tomorrow.

There were a couple others that were also higher in Blairmore Creek, but they were substances like calcium and lithium and sodium, ones that haven't -- they're not necessarily the -- the higher risk -- or those that were the higher risk for predicted.

Q Okay. And when you say that the concentrations in the end-pit lake were protective of Blairmore Creek, what do you mean by that?

A By that, I mean that we can take the results that we did for those risk calculations for the end-pit lake and, you know, essentially apply those to Blairmore Creek, and we know that the actual hazards for Blairmore Creek would be lower than that.

Q Okay. It was my understanding from our earlier conversation that the end-pit lake concentrations weren't derived using, kind of, the updated water quality modelling, or am I mistaken? Do I have that wrong?

A What I stated is the concentrations that we used for

the calculations for end -- the end-pit lake are higher than the concentrations --

Q Oh, okay.

A -- for revised modelling in Blairmore Creek so that we know that those calculations, therefore, are protective of Blairmore Creek, like I said, with the exception of aluminum.

Q Okay.

A MR. HOUSTON: So what we're proposing, Mr. Chair, if -- if this is acceptable, is we could rerun the human health evaluation for aluminum, and we could do that in short order, based on the aluminum concentration in 6.25. And we -- we could provide that to the Panel, you know, before the end of the evidentiary session -- section of this hearing.

Q Okay. Just hold on a minute.

A While I'm saying that, Mr. Chair, our eyeball evaluation is that there will be no essential difference, but we do recognize the numbers are -- are different, so that -- that will just close off the loop.

Q Okay. So we also gave some thought to maybe a different way to get at this issue over the lunch break, and so I'll kind of put that to you and see what you think about that.

So the concern, of course, is understanding the

hazard quotients for exposure to Blairmore Creek, and the concern is that by not using the updated modelling, you know, they might increase with the updated modelling, but we don't know by how much. That's kind of the issue. And we're not concerned about increases in HQs that are, you know, an order of magnitude below 1 or more. We're most concerned about those ones that approach 1 and how much they might exceed the hazard quotients of 1 by.

So let me run this by you and see if this would be doable in a reasonable amount of time. So could Benga provide the results of recalculated incremental lifetime cancer risk from arsenic exposure for Blairmore Creek using the updated water quality modelling results and ensuring that air deposition is added to the modelled water concentrations to produce a total water concentration and using -- if there are any corrections of errors that you need to incorporate from that earlier calculation, those would be incorporated as well.

And then could you -- so doing that for arsenic, and then recalculating the hazard quotient for one other contaminant of potential concern which had the greatest increase in predicted concentrations in water relative to the original model predictions? And that might be aluminum. I'm not sure whether it would be or

not.

So, essentially, what we're saying is rather than doing it for a whole suite, could we do it for arsenic and one other that is likely to have the greatest potential increase? Is that an amount of work that would be doable in a short period of time?

A So to be clear, Mr. Chair, you're -- you're asking us if we could redo arsenic including a air deposition component and redo one other, and I -- I would suggest aluminum would be a good case study because we've -- we've already discussed that it's -- it's higher in Blairmore Creek than the end-pit lake.

So let me just check with my team and see if that is something that we could do. And I think you're thinking of a time frame like tomorrow; right? That --

Q Yeah, soon, so that it won't delay final argument. So whether it's tomorrow or, you know, the day after.

A Okay.

Q We are still waiting for the ACO report, so the record will remain open for a brief period of time, of course.

A Okay. Let -- let me just check with my team and --

Q Oh, sorry. Sorry. I just got a note from my risk assessment specialist. Just let me read it.

Okay. So the suggestion was not to use aluminum as the other, so we still want arsenic, but to use the COPC that had the greatest increase between the

original modelling results and the revised modelling results for Blairmore Creek. That would help us understand the magnitude of a potential increase to the HQs.

A Okay. Let -- let me check with my team, Mr. Chair. One moment.

Q Okay. Thank you.

MR. IGNASIAK: Mr. Chair, it's Martin Ignasiak here. Just while Mr. Houston's checking that. Ms. Bauman has a previously scheduled appointment at 1:30 she can't move. We didn't expect her to still be on, so to the extent there's questions for her -- I know it's only 20 minutes' notice, but Mr. Kansas will still be on the panel. But if we could have your leave, if she could depart for that appointment, that would be appreciated.

THE CHAIR: I think that should be fine. I think most of my questions will be either for Mr. Mitchell or Ms. Mooney or Mr. Houston.

MR. IGNASIAK: Thank you, sir.

A MR. HOUSTON: So, Mr. Chair, we -- we've been discussing, and that -- that should be doable. We should be able to get you something tomorrow or, at the latest, on -- on Wednesday. Yeah. That -- that works.

Q THE CHAIR: Okay. Yeah. So let me just kind of make sure we're all clear on what the

undertaking is.

So you'll conduct -- I'm going to kind of reread it, just because we've had a bit of back-and-forth, and try and capture what we discussed. So Benga will conduct a recalculation of the incremental lifetime cancer risk for arsenic exposure for Blairmore Creek using the updated water quality modelling results and ensure that both the air deposition and the water-based pathways are both included in the calculation -- 'cause there was a discussion about whether that had happened or not -- and using the same correction of the input error to the arsenic calculations that was previously identified by Benga if needed, and then recalculation of the hazard quotient for the contaminant of potential concern which had the greatest increase in predicted concentrations in water relative to the original GoldSim modelling, and was one of the ones that exceeded the risk quotient of 0.2, so if you could pick one from that. I think -- I think that captures it.

A That -- that's agreeable, sir.

Q Okay. So --

A MR. MITCHELL: I just have one more clarification just to a question that we kind of left hanging a bit this morning, and that was your -- your question about the hazard quotients for certain metals -- I think thallium was an example -- being the

same for the --

Q Right.

A -- three different water bodies.

So I did go back and -- and check our multimedia model, the original calculations, and confirmed that the reason for that -- and I -- I looked at thallium in particular and -- and lead as well. And in the case of thallium, the predicted exposures was -- were almost entirely arising from fruit and berry ingestion; in the case of lead, it was dominated by the soil ingestion. And that's why the hazards weren't different between the different water bodies for these substances.

Q Okay. Thank you for that clarification, Mr. Mitchell.

THE CHAIR: So let's get an undertaking number for that previous undertaking we were just discussing.

MS. UTTING: Mr. Chair, Tracy Utting, Panel manager. That would be Undertaking Number 27.

THE CHAIR: Okay. Thank you.

Q THE CHAIR: Okay. And thank you for your cooperation on that, Mr. Houston and Mr. Mitchell.

A MR. HOUSTON: Thank you, Mr. Chair.

Q Okay. So now we're going to change topics a little bit, and I'm going to be asking some questions about coal dust.

So risk from chronic exposure to coal dust was

assessed using a toxicity reference value for PM 4. All three locations where the hazard quotients were greater than 0.2 were within or at the mine permit boundary. Benga concluded that the potential risk of adverse health effects caused by chronic exposures to coal dust was negligible. This conclusion was based upon the use of a toxicity reference value for PM 4, restricted access to locations where predicted hazard quotients were greater than 0.2, and the fact that all predicted hazard quotients were less than 1, except for a location at the pit boundary. And I do have references for all those if you want to check any of them.

Benga states that: (as read)

Changes in particulate matter, including PM 10, PM 2.5, and total suspended particulates can result in effects which include nuisance effects. Sources include fugitive dust emissions from mine vehicles, coal processing, and soil and coal handling. Benga is committed to a number of dust mitigation measures which are summarized in CIAR 360, Table 2-1, on PDF page 85. These measures focus on mitigation of road dust as well as dust generation from coal handling and rail loadout. Benga also commits to

progressive reclamation and revegetation to reduce windblown fugitive dust.

So the question -- first question is: Given that coal dust is a complex mixture of contaminants of potential concern associated with a wide range of particle sizes, how is the use of PM 10 as a surrogate for exposure and a toxicity reference value for PM 4 justified?

A MR. MITCHELL: Well, to be clear, while we -- while we -- while we looked at coal dust using the -- the PM 4 toxicity value and the PM 10 concentrations, we did also look at the individual constituents of the coal dust, including the polycyclic aromatic hydrocarbons and the metals, as well as looking at the -- you know, the PM 2.5 and the PM 10 data. So we kind of used multiple different lines of approach to look at coal dust rather than just treating it as a single number.

Q Okay. Thank you.

What is Benga's understanding of the current scientific opinion expressed in the peer-reviewed scientific literature regarding the appropriate surrogates for coal dust toxicity and risk, particularly to sensitive subpopulations?

A Just give me a moment. I'll talk with one of our toxicologists on that.

Q Sure.

A So we -- we didn't take a -- a surrogate on the -- approach on the basis that a single surrogate was unlikely to capture the complexity of the -- of the matter. So, again, we used a value that was, you know, the best available number we could get for coal dust itself, but we also did look at all the individual constituents, including the polycyclic aromatic hydrocarbons, and, you know, we do -- we do have data to suggest that some of those constituents are likely to be of low bioavailability when associated with coal specifically, but, you know, we still looked at the calculations without trying to adjust that bioavailability down.

So the -- and the -- you know, again, for reference, there -- there is a tox profile for coal dust that was put into this report. It was in CIAR 251, PDF page 665.

Q Sorry, Mr. Mitchell, did you want to pull that up or was that -- was that the end?

A (INDISCERNIBLE - OVERLAPPING SPEAKERS) I don't think I need to. I was really just pointing out that there is a -- an -- an assessment that sort of summarized the -- the state of the data as -- as we understood it when we were doing this risk assessment, but, again, we didn't use a single surrogate but, rather, looked at the coal dust as a single substance but also considered the

other constituents as well.
Q Okay. Thank you for that, Mr. Mitchell.
So I think this just follows on from what you were just telling me, but is Benga confident that the toxicological risk associated with chronic exposure to coal dust has not been underestimated, and, if so, why?
A Again, I think to the -- you know, the -- the current state of the science and what -- and, in particular, the -- sort of the authoritative reviews and the regulatory reviews, we think we have assessed this conservatively, and, again, not -- because we did not just assess coal dust as a single substance but also looked at the pH, the metals, the smaller particulates, and got that -- got that big picture, so -- and -- and when you sort of combine in -- you know, the conservatism in the air modelling and the assumptions that go into that, I think we're confident that we've been protective.
Q Okay. Thank you, Mr. Mitchell. Just a minute.
Is your confidence based at all upon reviews of epidemiological evidence, such as that presented or referenced by the Livingstone Landowners Group?
A We -- we did look at epidemiological evidence, and that -- that feeds into all -- I mean, the -- the actual toxicity limits that we select are ones that have been, you know, developed or approved by -- by

regulators, but, you know, in the -- in the case of the epidemiological study that had been presented earlier, that -- that study actually concluded that they couldn't conclusively establish any health effects.

The challenge with the epidemiological studies is that there are, you know, often a lack -- a lack of controls, lack of accurate measurement of exposure. Different circumstances are different for different people, and the populations themselves are different, so there's things like differences in diet and genetics and the like that also affect a lot of the end points.

So, you know, the -- the conclusion of the particular study that had been referenced earlier was really that they -- they couldn't actually come up with a conclusive determination of -- of health effects because of those compounders and biases in the data, but we certainly do look at that as well.

Q Okay. Thank you, Mr. Mitchell.

Why did Benga not include an assessment of the nuisance effects of coal dust on health?

A MR. HOUSTON: Mr. Chair, nuisance effects of coal dust, are -- are -- are you referring to -- I don't know -- some kind of psychological effect on -- on health?

Q Yeah. So let me -- let me -- I'll put that in my follow-up question to you, and that might help as well.

So is Benga aware of any published scientific literature on the nuisance effects of coal dust on human health?

And as you were kind of getting into, Mr. Houston, that could be a range of things that could be, you know, mental effects related to, you know, anxiety and -- and all of that that potentially manifest into physical effects as well.

So I was just curious as to what Benga -- first of all, why Benga didn't really talk about this issue in their assessment and, secondarily, what you know about what the literature currently says about these kinds of effects.

A So I'm not a human health specialist, Mr. Chair, but we did talk about a report that was done in Sparwood. I think it was Friday. Anyway, late last week we talked about a -- a kind of follow-up study that had been done by the community of Sparwood, funded by Teck, after having built four mines in -- in the region. And I recall in that study that qualitatively, coal dust or dust was a primary concern for the residents. And -- and I'm not -- not sure of the psychological value of that, but certainly from a social concern level, that -- that was top of mind for the people in that community.

What we have offered, first of all, is a suite of

mitigation measures to -- to keep dust and coal dust down to levels that are acceptable, but, also, we've -- we've committed to a community committee that would try to address these issues up front and -- and get them on the table early in the project so that if -- if there are impacts or perceived impacts due to coal dust, that those would be addressed between the company and -- and the community, and -- and we would also look to the community to help us identify potential solutions to some of those issues.

So I -- I think it is an issue in Sparwood. I don't know to what extent that affects health, but I -- I can imagine that there is some impact at some level. Our -- our intent is to mitigate and to keep an open dialogue with the community to -- to identify if we're -- if we're going offtrack in that area.

Q Okay. Thanks for that, Mr. Houston.

Mr. Mitchell, are you aware of any kind of published scientific literature on this topic?

A MR. MITCHELL: I haven't personally looked at that topic. I can certainly talk to some of our dust experts what -- what their familiarity is, but --

Q That's fine. I was just interested in your perspective.

A No. I mean, I -- I think our -- our risk assessment was focused on the -- the -- the -- sort of the

physical toxicity side of things, and when it comes to nuisance, I don't claim expertise on nuisance, but I think nuisance can vary between different people, so it's a little bit trickier to assess, aside from looking at is dust concentration going to increase substantially over background based on the air modelling.

Q Okay. Thank you.

This is probably more for you, Mr. Houston, but what are the primary causes of conditions which may cause coal dust incidents and community complaints? And when you're providing your response, maybe you can think about operational conditions as well as weather-related conditions.

A MR. HOUSTON: Well, as you know, Mr. Chair, we've proposed -- and when we talk about the community, I'm thinking primarily of the -- the townsite. So in terms of the operation, we've proposed a cladded rail-loading structure. We've proposed a covered conveyer. We've proposed to top the railcars with a lacquer to keep dust from blowing about. And -- and so those -- those are some of the primary mitigations in the coal-handling, directly, facility.

So outside of an upset, and -- and by that, I mean coal, for some reason, spilling outside of that contained system, I would think those -- those measures

should be fairly -- fairly suitable and -- and should deliver the results. If there were an upset, of course, it would depend upon our emergency response procedures to get in there early, clean it up, and -- and get back to normal operation.

Aside from all of that, my understanding is that one of the primary causes of spread of coal dust is vehicular traffic that is on the mine and off the mine and -- and tracking dust down the road, which eventually gets everywhere. And -- and so we've proposed two measures to mitigate that. One -- one is that we'll try to keep vehicles in the mine, in the mine and vehicles not in the mine parked off-site. So that -- that will help to minimize, to -- to a large extent, any dust being tracked down the road.

The other is we'll have a wash bay at the site, at the mine, and the intent there would be to wash equipment before it comes out of there to ensure that not only coal dust but weed seeds aren't -- aren't spread into the community.

Q So in addition to traffic tracking from vehicles, are there other, kind of, operational issues that might require an unusually high amount of dust, or -- or is the tracking of vehicles the only one that you can kind of think of?

A The only normal part of the operation that -- that I

can think of, Mr. Chair, that would -- would tend to track dust into the community. That -- that's -- yeah, I can't think of others.

Q Okay. Based on the experience of operating mines that you may be familiar with, do dust complaints received from the public generally correlate well with PM 2.5 or PM 10 monitoring data?

A I -- I can't really comment on that, Mr. Chair. I don't know.

Mr. Rudolph, do you have any thoughts on -- on that one?

A MR. RUDOLPH: I -- I've had some experience in other northern mines, I guess, in Alberta -- not northern mines, but mountain mines. And there, I think, complaints correlate relatively well with -- with PM 10 monitoring which is conducted in there. I don't remember if TSP was -- is actually measured there or not. They do also correlate with -- with dustfall measurements as well. In my experience, though, PM 2.5 isn't always the -- the right parameter for comparing monitor data to -- to community complaints.

Q Okay. Thank you, Mr. Rudolph.

Okay. I'm going to change topics a little bit away from dust. Again, back to this issue of conservatism in the health risk assessment. So Benga concluded that emissions from the project are not

predicted to pose a risk of adverse health effects at locations accessible to the general public. Benga acknowledged that hazard quotients greater than 1 were predicted; however, Benga noted that the hazard quotients greater than 1 typically occur within the mine permit boundary in an area with restricted road access and low likelihood of continuous public presence during construction and operations of the mine or were due to pre-existing baseline emissions or background concentrations with minimal contributions from the project or were a result of the conservatism built into the assessment, air-dispersion models, and derivation of water concentrations.

Benga stated that the predicted risks to human health from exposure to the end-pit lake were within acceptable limits in most cases; however, hazard quotients associated with the project's contributions from the end-pit high walls to surface water were a substantial contributor to the application hazard quotients results.

Benga stated that given consideration of apportionment to drinking water and the margins of safety built into the human health risk assessment, the results of the human health risk assessment are not considered indicative of a human health concern; however, management considerations of the EPL are

warranted, and actual measured concentrations at the time of EPL creation should be used to revisit the human health risk assessment.

So the first question: Could Benga comment on the overall level of conservatism and accompanying margins of safety in the health risk assessment having regard for the issues we've discussed so far, including some of the earlier calculation errors in the derivation of water concentrations of contaminants of potential concern, the use of predicted water concentrations produced by earlier modelling which are lower than produced by updated modelling, the degree to which predicted project air and water concentrations may exceed baseline concentrations for some contaminants of potential concern, the screening out of the groundwater -- some groundwater pathways, and the uncertainty inherent in the assessment of health effects of coal dust as a complex mixture, including consideration of the effects of nuisance dust levels on health?

So, again, looking for a comment on your confidence in the overall level of conservatism in the health risk assessment having regard for those things.

A MR. HOUSTON: That was a really long question, Mr. Chair.

Q It was. I apologize for that.

A So I -- I may be able to speak for a minute here, and then I'll ask Mr. Mitchell to -- to chime in.

To a large extent, we've used conservative modelling to predict the presence of chemicals of potential concern or contaminants of potential concern in both the water and the air. We were talking about the end-pit lake earlier and -- and the concentrations.

I've found out over the lunch hour, Mr. Chair, that the level of selenium and other chemicals in the end-pit lake, for example, were based on an assumption that 2 metres of the wall that forms the end-pit lake is -- is actively leaching. And, you know, that -- as an example, that -- that evidently is not true. It's not broken rock. It's solid rock. And so it won't have the surface area that rock in the ex-pit dumps does, for example.

And so when we look at the end-pit lake and the concentrations that we've predicted there, we clearly have taken a very conservative approach. We don't expect to -- to see that level of contaminant in the end-pit lake. Nonetheless, we've run our human health risk assessment on that end-pit lake. We've assumed that somebody drinks water out of the end-pit lake every day. Again, that is super conservative -- I -- I can understand somebody camping beside the lake and drinking water for a week, for example, but -- but to

drink water every day out of the end-pit lake, that's clearly a very, very conservative assumption.

And those are the same assumptions we've made for Blairmore Creek or Gold Creek, that somebody is drinking water untreated out of one of those creeks every day of their life.

The -- the same is true for the air vectors. And as Mr. Mitchell has pointed out, air -- we're -- we're assuming that somebody's breathing that air consistently over a long period of time or somebody is eating vegetation that the dust has fallen on, for example, from an area next to the -- the mining operation, and they're doing that repeatedly over a consistent period of time.

Those are all really conservative assumptions, not even realistic assumptions, in -- in my opinion. And so it's -- it's that kind of conservatism that gives us a high degree of confidence in what we've done.

So, Mr. Mitchell, I'd -- I'd invite you to chip in here, and if I've misconstrued anything, be -- be sure to correct me on the record.

A MR. MITCHELL: Thank you, Mr. Houston.

I -- Mr. Chair, I think Mr. Houston has summarized, you know, at least a few of the key areas where conservatism is built into the process, such as on -- on the water side, for example, assuming that the

water is somebody's, you know, sole source of drinking water over a chronic or possibly lifetime period of time. And, you know, another element is we -- we really tried to closely follow approved regulatory procedures or -- or approved -- or Health Canada methodologies that, again, we know have defensibility and conservatism built into them specifically for that -- that -- that same purpose.

Again, we've assumed for inhalation -- we looked at both short-term and long-term exposures. And those long-term exposures assume that somebody has been breathing air from a certain location over a very long period of time, years to -- to a lifetime. The acute exposures are assessed and using toxicity reference values that are protective of sensitive populations. For example, some of them have considered things like effects on an asthmatic who's undertaking heavy exercise and having, you know, effects on their lung -- lung capacity. They are reversible and temporary, but we still want to make sure that we protect against that level of effect.

So there is -- there's sort of multiple levels of conservatism that are built into the risk assessment process throughout it, particularly following the methodologies that have been established by Health Canada and other -- other regulatory agencies and using

the toxicity limits that have been developed or endorsed by these agencies, which, again, are -- are levels at which -- you know, when we have exposure that's exceeding one of these -- these levels, it doesn't mean that there will be adverse effects, rather, there's conservatism built into these so that we're confident where we're under them, there won't be an adverse effect. So there's multiple levels of conservatism throughout.

And, you know, sometimes in risk assessment, we actually talk about a -- a -- a snowballing effect of conservatism where you have a conservatism -- a conservative assumption on one piece of the risk assessment that, in and of itself, is not unreasonable if it's within the realms of possibility, but then you add on another similar assumption on another aspect and a third aspect and a fourth aspect, and by the time you sort of combine all of these levels of conservatism in -- in some elements of the risk assessment, particularly around the multimedia model, we get conservatism on top of conservatism on top of conservatism. And a really high level of -- of protection gives us confidence that these levels are -- that these predictions are conservative.

Q Okay. Thank you for that, Mr. -- Mr. Mitchell.

So having regard for those various levels of

conservatism that, as you say, can snowball, if you are approaching a hazard quotient of 0.2 or 1, what would your view be as to the overall level of conservatism, you know, in terms of magnitude? Like, are we talking, you know, those risk calculations are, you know, ten times, you know, what it's likely to be, five times, or is it a question you can even answer?

A It really depends on what aspect of the risk assessment we're talking about because some aspects have more levels of conservatism built in than others. And, you know, some of the water pathways or the multimedia exposure pathways, for example, have, you know, multiple calculations that have conservatism built into them, and, you know, the -- you know, a -- a predicted hazard of .2 or point -- or 1 would trigger us to more look at, you know, just how much conservatism is built into there. Is it -- is it a -- is it reasonable or not? But I don't think you can put a -- you know, a universal number that it's always five times or ten times.

When we get to the air side, you know the -- the side that's done on the risk assessment is maybe a little bit more straightforward 'cause it's really just based on toxicity limits and the air modelling. And, perhaps, you know, Mr. Rudolph can comment more on the level of conservatism that's built into the -- the air

modelling. But it -- but, again, we know that as long as we have a concentration in air that we're starting with that's a -- that's an upper bound and we're using a toxicity limit that has protection built into it to ensure that we're confident there won't be an adverse effect as long as we're under that, that we've got a -- we've got a high level of conservatism. Again, I can't put a number on it -- is it -- is it five times, or is it ten times -- because some of these limits have uncertainty associated with them, and that's why we have these safety levels built into them, is to make sure that we're protective of that uncertainty.

Q Okay. Thank you, Mr. Mitchell.

Okay. Going to move on to something we did talk about briefly already. So in CIAR 313, PDF page 1275, Benga states that: (as read)

> Management considerations for the end-pit lake are warranted, and actual measured concentrations at the time of EPL creation should be used to revisit the human health risk assessment.

And, Mr. Houston, you spoke to this a little bit earlier.

But what specific types of management considerations or actions might be necessary to manage risk to human or wildlife health?

A MR. HOUSTON: I -- I think that, you know, the key here is the leaching of chemical -- chemicals of potential concern in -- into the end-pit lake water. And I -- I think, first of all, we're going to learn a lot as we go through the mining based on our experience with the ex-pit dumps and based on a better understanding of the -- the -- the quality of the rocks that we're -- we're working with.

As I mentioned just now, the end-pit lake concentrations are based on leaching from 2 metres' thick of pit wall -- end -- end-pit lake wall in -- into the water, which -- which is not really -- which is a very conservative assumption, considering that that would generally not be fractured rock.

Some of the things that we -- we may want to consider when we do the end-pit lake design is -- is, first of all, what is the quality of the rock where the end-pit lake will be? And if there are areas that potentially have a higher propensity to -- to leach into the water, is there something we can do to provide a -- a sealing surface or something to -- to minimize that? Or can we physically move the end-pit lake to -- to a slightly different location to avoid some of those -- those things? So I -- I -- I -- again, it's -- it's difficult to provide specific answers until we understand what the specific concern is with a

design of the end-pit lake.

Q Okay. Thank you, Mr. Houston.

So your overall conclusion regarding no adverse effects on health -- on human health is for the construction and operation periods. What is your overall conclusion regarding the risk of adverse effects on health in the postclosure period, including but not limited to the exposure to the end-pit lake, and what's the basis for that conclusion?

A Again, we're -- we're going to have to defer, to a certain extent, a discussion around the end-pit lake. I think we were talking in a previous session that designing the end-pit lake a decade or 15 years out from when it's actually going to be formed is -- is probably of -- the appropriate time frame. And doing that design based on experience that we've gained through a pilot project, for example, to -- to assess in more detail the -- the potential for leaching of -- of chemicals of potential concern into the end-pit lake.

So our intent would be to design an end-pit lake that eventually could be given over to multiple unsupervised uses, let me say. And -- and that would be the intent of that design process. A suboptimal solution, I would say, is -- is if somehow the use of the end-pit lake had to be restricted post --

postclosure, but that -- that is another alternative.

Q Okay. Thank you, Mr. Houston. I might have narrowed your answer a little unnecessarily there by my reference to the end-pit lake.

The water quality of Blairmore Creek is also expected to not return to baseline for a prolonged period after the project ends. With respect to human health risk associated with Blairmore Creek, are you similarly confident that -- that there won't be an unacceptable risk to human health?

A So the evaluation we've done for the operating phase would -- would apply through to the post -- post-operation phase. We would be monitoring water quality in Blairmore Creek, and we would be responsible for treating water through the SBZ and the other water management structures until it was demonstrated that the site was able to be -- be left to -- to manage itself.

So monitoring would continue for the long-term. The health effects that we've analyzed for the operating phase would -- would also apply in the long-term if the water quality was -- remained the same or -- or better than during the operations phase.

Q Okay. Thank you.

So I do have some questions on monitoring in follow-up, so I'll kind of turn to those now.

So Benga's proposed aquatic monitoring plan doesn't make explicit reference to inclusion of contaminants of potential concern to human health nor does it include reference to drinking water quality guidelines.

Benga's proposed air quality monitoring and adaptive management plan references several regulations, many of which do incorporate protection of human health. Benga's proposed monitoring program focuses on fugitive dust, nitrogen oxides emissions, and PM 2.5 emissions.

Benga has committed to continuous monitoring of ambient air quality near the eastern edge of the mine lease and in Blairmore near the loadout facility and recommends the use of indicative monitoring rather than traditional regulatory monitoring at both sites.

Benga's proposed groundwater monitoring program will focus on the shallow to intermediate groundwater systems that have the potential to discharge near or into surface water receptors, including Blairmore Creek and Gold Creek. One set of monitoring wells to be installed have proposed locations which are similar to those proposed for the surface water monitoring plan as part of an integrated groundwater and surface water monitoring program. Water samples will be collected from toe springs associated with drainage from rock

dump areas as well.

So just a couple of questions. What is Benga's view of a potential condition of approval to monitor contaminants of potential concern in country foods if concentrations in air and water are shown to be increasing and approaching air or water quality guidelines related to human health?

A I -- I think that would be reasonable, Mr. Chair. Our -- our expectation, because of the conservative nature of our modelling to date, is that when we monitor the air quality and the -- the water quality, that we're going to be within the envelope we've -- we've -- we've drawn in our application.

If -- if that were not the case, we -- we would expect that additional investigation into the source on the one hand to identify additional mitigation but also additional work on the monitoring side or the -- and, as you suggested, country foods monitoring, that -- that would also be appropriate. I -- I'm not quite sure what that looks like, to be honest, Mr. Chair, and -- and how frequently it would be done. I would expect something like an annual program based on seasons, but I -- I think that would be appropriate.

Q Okay. And what constraints and challenges might Benga face if such a condition were included?

A To monitor country foods if we exceeded our air quality

guideline, that's --
Q Yeah.
A Yeah.
Q If contaminant levels were approaching health-based limits.
A Again, I -- I -- I'm not sure what constraints there would be on monitoring. We would need access to the -- the -- the food -- the country-based foods that we were monitoring. So access on the land to gather would be a constraint, I -- I suppose. I can't think of anything else, Mr. Chair. Our -- our -- I -- I can tell you our -- our primary focus would be on additional mitigative measures to get us out of that situation if -- if we found ourselves there.
Q Okay. Thank you.
And would Indigenous communities be invited to participate in that type of monitoring, and would Benga pay for their participation -- well, pay for that monitoring?
A We -- we've already committed to pay for an Indigenous-based monitoring program, and -- and that would be directed by the Indigenous communities, but I -- I think it would be natural to include a component in that program to monitor country-based foods.
Q Okay. And what is Benga's view of a potential condition to increase the frequency and/or spatial

extent of monitoring when contaminants of potential concern are found at levels approaching or exceeding federal or provincial drinking water or air quality guidelines or risk-based benchmarks in order to confirm exceedances and in support of adaptive management?

A Would we agree to a condition that required us to double down on our monitoring or add to our monitoring program should we find ourselves close to limits?

Q Yes.

A Again, it's not very specific, but I can understand that additional monitoring might be a reasonable thing to do under those circumstances.

Q Okay. Thank you.

Given that background concentrations of some contaminants of potential concern already exceed drinking water quality or air quality guidelines, is Benga confident that there is a sufficient understanding of natural variability of background concentrations to distinguish project-related contributions from background contributions?

A When we're discussing water, Mr. Chair, I -- I would think that we would distinguish background from -- from project-related contributions simply by looking upstream of the project-affected zone and looking at water quality upstream as compared to water quality downstream of the project. I -- I would think that

would be the best way to differentiate between natural variability and -- and project-affected contamination.

Q And what about for air?

A Again, I -- I think that looking outside of -- of the immediate area of the project and -- and comparing air quality at some distance to air quality closer to the project would give us a good reference point.

Q Does Benga intend to collect additional baseline data before construction and operations commence to increase knowledge of air, surface, water, and groundwater baseline conditions and natural variability?

A We are -- we are continuing our air-monitoring program at Blairmore, and so that will continue, and continue right through the construction and into operations, that -- that particular station. We have done some dust collection monitoring closer to the site, and that's -- that's provided us with some baseline, but we'll continue to do -- to do that work.

In terms of water quality, we have taken spot samples, and we will continue to take spot samples of water quality up to and -- and right through operations and construction. So we -- we are collecting data, Mr. Chair, and we will continue to do so.

Q Okay. Thank you.

A MR. RUDOLPH: Mr. Chair, it's Mr. Rudolph. Perhaps I could just add to what -- what

Mr. Houston said and specifically with respect to background monitoring. We -- we -- we are collecting continuous data at the -- at the monitoring site in Blairmore at this time, and I think the -- frankly, the easiest way and the best way to look at the effect of the project differentiated from background is simply to look at the data by wind direction. So at that current site, if that's what's chosen, you know, when winds are coming from the westerly portion, that will include a project effect. If it's coming from the southeast up the valley, that would be indicative of background at that location. So I don't think a -- a separate site is necessary to collect background data.

Q Okay. Thank you, Mr. Rudolph.

Maybe just a follow-up question for you, Mr. Rudolph. Can you comment on the available methods for monitoring levels of nuisance dust that don't rely on PM 10 or PM 2.5? I think earlier you spoke about dustfall monitoring. Does that serve that purpose, or is there -- are there other methods?

A Well, it's -- it's definitely a low-tech method, but it is, actually, I think, the most reflective of nuisance dust that is currently done. I -- I don't believe that PM 2.5 or PM 10 or even TSP really are -- collect large enough particle sizes that -- that reflect on the nuisance portion of the -- of the dust.

All of those -- all of the dust that we see -- the TSP is about 30 microns or so and smaller, and that is, you know, essentially invisible and perhaps would be visible if it collected on a surface, but it's pretty small to be termed "nuisance dust". I think dustfall is probably a better way of measuring it, actually.

Q Okay. Thank you.

So just returning to something I asked about earlier. Does Benga think there is merit in attempting to correlate community dust complaints with dust-monitoring data, whether it's PM 10, 2.5, total suspended particulates, or dustfall, total dustfall? And if not, why not?

A MR. HOUSTON: I -- I -- I think there is merit, Mr. Chair, and -- and we have been collecting dustfall data at various points for some years now. So we would continue to do that, and -- and certainly it would be an interesting point of reference if there were complaints to -- to try to understand why those complaints are arising and if -- if they're based on actual increases in dust or just a perception of increase in dust. So I -- I think it's important to have that bit of evidence when you're -- when you're dealing with a complaint.

Q Okay. Thank you, Mr. Houston.

Okay. I'm going to turn to some questions around

cumulative effects related to health. So Benga stated that people are potentially exposed to both individual chemicals and chemical mixtures originating from chronic inhalation exposure as well as multimedia exposure, so oral and dermal exposure. Benga goes on to state that additive risk is more -- is more than a chemical-by-chemical evaluation and specifically evaluates the potential for human health risk due to cumulative exposure to all COPCs from all pathways, including water-based pathways.

Benga stated that HQ and cumulative incremental lifetime cancer risk results were calculated assuming Indigenous receptor characteristics because they represent the most sensitive receptor group based on their assumed lifetime exposure within the LSA and RSA, and a higher assumed ingestion rate of traditional and country foods, such as local fish, wild game, and vegetation, than other receptor groups.

Benga explained that HQs and cumulative incremental lifetime cancer risk values for all other receptors at the same locations would inherently be lower. It was conservatively assumed that an Indigenous person would live and harvest food from all the human health risk assessment receptor locations, including the locations along the edge of the pit.

In CIAR 313 on PDF page 1272, Benga concluded that

when combined hazard quotients results for multimedia -- i.e., oral and dermal -- and chronic inhalation exposure routes with similar critical effects pathways, such as liver and kidney, were assessed, no change in predicted risks was predicted.

The Piikani Nation stated that Elders have been experiencing lung problems recently, with many resulting health issues. They said they are already experiencing this from other projects, including Turner Valley and the gas wells, related to the westerly wind from the mountains to the plains.

Jillian Lawson stated that inversions can trap contaminants for several days, allowing for the accumulation of particulate matter, sulphur oxides, nitrogen oxides, and other coal dust pollutants. Ms. Lawson expressed skepticism regarding coal dust being effectively mitigated, given limited water supplies for dust mitigation, low rainfall, limited snow cover, and drying winds.

So the question is: Given the naturally high background concentrations of some contaminants of potential concern, such as nitrogen oxides and dust in air, and aluminum, barium, cadmium, copper, lead, manganese, thallium, and zinc in water, the prevailing wind directions and other anthropogenic sources of contaminants, what is the likelihood that

simultaneously multimedia exposure to multiple contaminants will result in a measurable increase and risks to human health, particularly in sensitive subpopulations?

So, again, apology for the long question. I can repeat it if needed.

A MR. MITCHELL: A -- a complicated question, and, if you don't mind, I'll maybe take a quick moment to caucus with a couple of my peers, Mr. Chair.

Q Sure.

A MR. RUDOLPH: Mr. Chair, it's Mr. Rudolph.

Perhaps I could start off just by talking about some of the -- the issues relating to the air quality side. And, again, to -- you know, the -- the information that we present in the air quality assessment is based on the -- a combination of the -- you know, the worst-case -- worst-case emissions and the worst-cased -- worst-case meteorology.

So to the extent that in our five-year data set those conditions occur simultaneously, they've been captured in our air quality assessment. And those are the -- that's the information that gets fed into the health risk assessment. So, again, to the extent that they occur at any time and not necessarily the dust at the same time as the NO2, for example, and to the extent that we've captured any upwind sources in our

background concentrations that we add to our modelling results, that -- that information is already captured in our assessment and in the information that goes into the health risk assessment.

Q Okay. Thank you, Mr. Rudolph.

Mr. Mitchell?

A MR. MITCHELL: Yeah. So -- and hopefully I didn't lose the thread of your question, but I -- I think a lot of what we spoke to on the conservatism still applies here. And, you know, you referenced the high -- high background levels, and in a lot of cases, we predicted hazard quotients exceeding 0.2 or even 1 from background levels. That doesn't always actually mean that a background level is high. Again, it's a -- an indication of the conservatism that's built into some of these calculations and -- and assumptions.

And, again, where we're showing that the concentrations that are predicted are, you know, often small compared to background, again, that supports the -- you know, the -- the minimal effects of -- of the project. So, again, we look at these -- these -- these multiple lines of conservatism, and then, you know, and you sort of refer to the -- I guess the cumulative effect of -- of multiple chemicals. And -- and, again, we take the assumption that if the end point of the chemical is even similar -- not

necessarily the same, but even similar, that we -- that we add the effects together to, again, add another level of -- of conservatism, even -- even though, in reality, it may be, you know, a less than additive effect. So I think we're -- we're quite confident in the level of conservatism that was built into this -- this risk assessment.

Q Okay. Thank you, Mr. Mitchell.

So I'd now like to ask some questions about the circumstances where airborne contaminants of potential concern would be most likely to approach or exceed human health risk thresholds, particularly with respect to more sensitive subsets of people, such as people with preexisting respiratory conditions that could be downwind of the mine but beyond the mine permit boundary.

So probably for you, Mr. Rudolph, but what specific meteorological conditions would create maximum exposure of sensitive individuals to nitrogen dioxide, total suspended particulates, PM 10, or PM 2.5?

A In our -- in our modelling study, it was generally the light wind conditions that allowed -- and -- and certainly it -- it may depend a bit on the location of the individual, but if -- individuals in the community of Blairmore, for example, that would be under the conditions of relatively light winds, stable

conditions, the kinds of conditions that might allow the emissions to flow down the mountain toward the -- toward the community. There will -- there will be emissions -- high emissions -- higher emissions as well of dust during windy conditions, but that will also be diluted by the higher wind speeds.

Q Okay. Thank you.

The follow-up's probably more for Mr. Mitchell. So we note that Benga did not predict a risk of adverse health effects via chronic inhalation through additive contaminants of potential concern. Would any combination of contaminants of potential concern predicted to individually exceed a hazard quotient of 0.2 for multimedia exposure be expected to produce synergistic effects on human health when sensitive subpopulations of people are exposed to a combination of contaminants, such as nitrogen dioxide, coal dust, PM 10, and diesel particulate matter due to a combination of project and nonproject sources?

A MR. MITCHELL: Yeah. So the -- the Health Canada recommendation is to look at these combined effects through an additive approach. There have been various studies done on when synergistic effects occur. And by "synergistic", we mean, you know, really, I guess the -- a greater than additive effect. I -- you know, I've read study -- or reviews that have been put

together by the European Commission and the -- and the OECD, for example, and generally the conclusion has been that at these sort of environmentally relevant levels of exposure that the -- that treated them additively -- additively as -- is -- is reasonable, that we're not really seeing, in most studies, synergistic effects that are much greater and additive at that sort of relatively low level of exposure. And --

Q Are there --

A -- the -- the additional factors, like using the target hazard quotient of 0.2 to start with as well -- as well as the -- the conservative way that we treat things additively when they're even similar or not necessarily the same.

Q Okay. Do you think there are plausible mechanisms for synergistic effects of this combination of airborne COPCs?

A I'm -- I -- I don't know if a lot of these combinations have been studied in enough detail in terms of the mechanism. A lot -- a lot of the mechanisms that we're dealing with for the particulate and the nitrogen dioxide, for example, I -- I don't think so, but, you know, often where we see the synergistic effects is where the effects are not the -- you know, those -- those lung effects or -- or respiratory effects, but,

rather, when they're actually absorbed into the body and being metabolized and interfering with metabolic pathways. So you -- you might expect to see that more from, for example, organic chemical exposures. But from the -- from the main drivers here, I don't think there's a lot of indication that I'm aware of of mechanisms for synergistic effects.

Q Okay. Thank you, Mr. Mitchell.

Turning now to waterborne multimedia exposure pathways where additive contaminants of potential concern would be most likely to approach or exceed human health risk thresholds. I'm going to ask you a few questions.

In CIAR 313 on PDF page 1256, Benga presented the toxicity end point groups, which are COP -- the COPCs which act upon the same organ groups. These include several metals, as well as polycyclic aromatic hydrocarbons, such as fluoranthene, pyrene, and the benzoate pyrene group.

Benga stated that: (as read)

All contaminants of potential concern within a toxicity group were assumed to have additive toxicity irrespective of their exposure route, inhalation, oral, or dermal.

In Table 7.5 to 7.8 in CIAR 313, PDF pages 1270 to 1271, Benga presented predictive additive hazard

quotients and incremental lifetime cancer risk results by toxicity groups for oral and dermal exposure.

On PDF page 1271 of CIAR 313, Benga states that: (as read)

No additive results for the project were greater than 1.

Could Benga explain the basis for this statement, given that -- and this is a long question -- given that the application case hazard quotients for oral and dermal exposure to end-pit lake water presented in CIAR Table 7.5, CIAR PDF page 1270, not only exceeds 0.2 but also exceeded 1 for the liver, kidney, and reproductive toxicity groups, and that these HQs were greater than the baseline case, albeit by a small margin.

And the application case hazard quotients for oral and dermal exposure to Blairmore Creek and Gold Creek water -- I'll dispense with the reference unless you want it -- also exceed 1 for the liver, kidney, and reproductive toxicity groups, and that these HQs were greater than the baseline case, albeit by a small margin?

So I don't know if you followed that, but I can distill it down for you if -- if you need me to.

A I -- I think I -- I -- I followed that, and I -- I believe what our statement was that the combined HQ results for the project, so that would be that -- that

first column in those Tables 77 and 78, did not exceed 1, and for the application case where there were hazard quotients greater than 1, they are almost entirely a result of the -- of the background multimedia exposure, so a relatively small contribution to the project. And, again, I think we're dealing -- we're dealing with hazard quotients of 3, 4, or 5 based on background. A lot of it is probably reflective of the conservatism that's built into these multimedia calculations.

Q Okay. So if -- I think I understood your answer. It's if I added -- if we added the two together, they would exceed 1, but you're attributing the exceedance primarily to background concentrations? Is that what I heard?

A Yes.

Q Okay. Okay. So that leads to the follow-up question. On PDF page 1271, CIAR 313, Benga states that: (as read)

> Application case exceedances were driven almost entirely as a result of the baseline case and therefore were driven by background concentrations through oral (multimedia) exposure.

Given that predicted project-related concentrations of contaminants of potential concern in CIAR 313, PDF page 1310 are substantially higher than background

concentrations, including for toxicity group contaminants, does Benga consider that a change to its statement regarding exposure being driven by background is required?

A Just to make sure I understand your question, Mr. Chair, you're talking about because the water concentrations to the project case were significantly higher than background, does that change our interpretation?

Q Well, you just -- you previously said in the -- in Benga's submissions it says that, you know, a lot of those exceedances are driven by baseline concentrations, but when we look at that -- that table in CIAR 313 on page 1310, if I got my numbers right, what we see are concentrations that sometimes are up to an order of magnitude higher than background. So we're kind of asking about the statement that the application case exceedances are driven almost entirely by baseline concentrations. It seems like that may not be correct. But that's what we're asking your opinion on.

A Yeah. And -- and that's because the -- the water concentrations are very small contributed to the -- contributor to those hazards. It's -- it's the same as the -- the question we had this morning that I answered after lunch --

Q Okay.

A -- within the thallium, for example, and found out that the exposure was almost entirely predicted to be through, you know, vegetation ingestion. And similarly with the -- some of the others, it's due to baseline concentrations in soil.

So the -- the concentrations in water are having a relatively small contribution to the total predicted risk, and that's, you know, why those project-related risks and hazards are -- are less than 1.

Q Yeah. One minute, please.

So the question is whether the calculation of water-based pathway contributions to additive risk and the conclusion related to that would change. So you talked about vegetation -- the vegetation pathway. Is that pathway dominated by airborne deposition or exposure?

A I -- I think the -- the reason why that -- that -- the baseline hazards are so high is just based on the actual concentrations that have either been measured or predicted in vegetation and soil and other media.

Q Okay. In the existing --

A Yeah. So -- so the actual --

Q Okay.

A The -- the -- again, if -- if the contribution from air from the project was high, that would show up in those -- in those project hazards. But, again, those

are relatively small compared to the baseline. So it's -- it's the background concentrations that are generating these -- these high hazards, not contributions from the project, whether they be in -- through air or water or other.

Q Okay. Okay. So just a follow-up question. Would any combination of contaminants of potential concern predicted to individually exceed hazard quotients of 0.2 for multimedia exposure be expected to produce synergistic effects on human health when sensitive subpopulations of people are exposed?

A I think the answer is similar to air, that -- I -- I certainly haven't seen any compelling evidence of synergistic effects of the types of contaminants of concern that we have at this site at this type of exposure level. Again, where we typically see those synergistic effects from contaminants like this is when we have really high exposures that are much higher than what we see -- than what we're seeing here.

Q Okay. Thank you.

So Benga provided separate assessments of risks of additive effects to contaminants within toxicity groups for inhalation and for oral and dermal exposure. Benga did not provide an assessment of total additive risk from additive effects from inhalation plus oral and dermal exposure.

Could Benga comment on the potential for the total additive risk from inhalation, oral, and dermal exposure from all contaminants of potential concern in the liver and kidney toxicity groups in terms of how much higher the total risk might be?

A Again, that -- that's part of why we use that target hazard quotient of 0.2. It's meant to reflect -- you do have potential exposure through different exposure routes.

I don't think we've done the -- the math and tried to add up, you know, inhalation hazard quotients and oral hazard quotients, and the end points might not be the same for those -- those types of exposure. But using that hazard quotients of 0.2 -- oh, I just got a message from one of our risk assessors that we did add them all.

Q Okay. Could you just tell us where that is?

A I will ask and find out.

I just found them. It's again in CIAR 313, PDF page 1272. There's predicted hazard -- hazard quotients, including oral plus dermal and inhalation, where there's similar critical effects.

Q Okay. Thank you. We'll take a look at that.

Okay. So that brings me to the end of my questions on human health risk assessment. You'll be happy about that. I do have some questions about the

wildlife health risk assessment. Ms. Mooney, you'll be happy to know I have fewer questions than I did for Mr. Mitchell. But I'm going to propose we take our break now and pick this up when we come back from the break. So it's 2:23, so let's come back at 2:40.

(ADJOURNMENT)

THE CHAIR: Okay. Welcome back, everybody.

Apologies, Madam Court Reporter. I understand I was going a bit fast, and none of my colleagues were brave enough to jump in and stop me. So if I -- I will try and do better. If I start going too fast, I'll deputize Mr. O'Gorman to intervene on your behalf should it become necessary.

Q THE CHAIR: Okay. So some questions around the wildlife health risk assessment. So Benga states that it used highly conservative or very conservative assumptions in its wildlife health risk assessment, and it lists them in CIAR 313, PDF page 1301 and also in CIAR 360, PDF page 17: (as read)

> The conservative assumptions include the use of maximum predicted air, soil, and surface water concentrations, and assumptions that wildlife would obtain 100 percent of food sources from habitat affected by the mine.

Benga initially concluded, on the basis of a

screening-level health risk assessment which did not include water-based exposure pathways except for atmospheric deposition to water bodies, that there is no potential risk of adverse effects associated with project emissions on the health of wildlife in the study areas.

Benga stated that because of the highly conservative assumptions used, the prediction confidence was high. A reassessment of risk to wildlife health, which included all water-based pathways, not just atmospheric deposition, concluded that except for selenium, the calculated exposure ratios for all contaminants of potential concern for all surrogate aquatic wildlife species in all habitats evaluated were below 1. Selenium exposure ratios of 1.7 and 3.8 were calculated for insectivorous and omnivorous birds in the end-pit lake, respectively.

In CIAR 360, on PDF page 15, Benga indicated that in the course of providing worked examples of the calculation of risk from selenium and zinc, Benga discovered that corrections had to be made relative to sediment ingestion. The results of reworked examples of calculation of risk from selenium and zinc produced exposure ratios from 0.03 to 4.1 for all habitats. Benga stated that these results indicate that the prediction -- that the predicted exposures are lower or

slightly higher than acceptable.

So the question is: Issues associated with the level of conservatism associated with predicted concentrations of contaminants of potential concern in water have already been discussed during the human health risk questions. Given these issues, as well as the need to use corrected sediment ingestion parameters, which was identified when worked calculation of wildlife risk estimates were provided for selenium and zinc, what is Benga's level of confidence that the overall conclusion regarding low risk to wildlife health is still consistently and reliably conservative?

A MS. MOONEY: That was a long question.

Q It was.

A I'm going to do my best.

I think those levels that were listed -- the points that were listed in CIAR 313 are still applicable, despite the bulk density conversion change that was made in the edit, that we have applied what we believe to be are the upper bounds of possible exposure. We have assumed highly conservative receptor characteristics, assuming that receptors would receive all of their exposure from that higher nodal model output, as well as their food sources -- their food sources would exclusively be from those higher

concentration areas -- that those receptors don't forage in other parts of the range, that they stay there, and that they don't migrate. They get -- you know, they receive exposure daily, 365 days a year.

We know that some of the species evaluated -- like the great blue heron, they have very large home ranges. They're not going to be staying in the small nodal spatial area that's been evaluated -- evaluated and -- so I -- I feel that we do have a pretty high level of -- of confidence in the conservative -- conservatism with respect to the receptor parameters that have been applied and the concentrations representing the upper possible distribution.

Q Okay. Kind of a follow-up question, then. The bulk density adjustment that you did that you had to correct, how big of a difference does that make in the results? And would the exposure ratios for the other parameters increase to a similar extent, as they did for selenium and zinc, or would it be different?

A It would be a -- a same relative change across compounds, but with respect to how the multimedia model accounts for the uptake into tissues is different, depending on the chemical-specific parameters. But the actual change in the sediment calculation would be relative across compounds.

Q Okay. Thank you.

In order to understand the consequences of assumptions used for predicted water quality more fully, could Benga confirm whether your overall conclusion that there would be low adverse health risks on wildlife health would still apply, given the exposure ratios for selenium exposure to Blairmore Creek water would increase if contact water capture is less than 95 percent and if the target selenium concentration of 15 micrograms per litre was not achieved?

And maybe just as a reminder -- sorry to add to the question, but -- so the predicted selenium exposure ratios for Blairmore Creek currently are 1 for northern river otter and 1.4 for great blue heron. So the concern is: If you didn't get the capture you're expected, how much might those increase?

A MR. HOUSTON: I -- I just want to jump in here for a minute, Mr. Chair. I -- 'cause it seems to me that we have other problems if we -- if we fail on the issues that you're talking about. So it -- it is a bit hypothetical. And I -- I think the answer's going to be, yes, the risk goes up, but, you know, we -- we've -- we've been conservative to get to those numbers that we were talking about for our water quality calculations, and we've put in some -- we've committed to a number of backup plans, you know, to

increase the probability of that happening or -- or to -- well, to increase the probability of that happening. So, you know, I -- I -- I don't really think it's an option to miss those targets, I guess, is what I'm getting to.

A MS. MOONEY: If I could just add to that. If the release -- the relative proportion of sulphate and selenium didn't change, it wouldn't have a significant change on the outputs for selenium due to the mitigating effect of sulphate. So it -- it would -- that -- that could influence the results as well.

Q Okay. Thank you.

What is the justification for Benga's statement that trophic transfer values used in the exposure modelling are thought to be very conservative? And does this statement apply to all contaminants of potential concern or just specific ones?

A So this would specifically apply to selenium. So I can start by giving the example in the lotic system, the trophic transfer factor that was applied for fish. So a value of 1.48 was applied. Notably, the trophic transfer factor for westslope cutthroat trout that's been published by the USEPA is 1.12. So the value that we have applied is quite a bit higher. And -- and it's important to remember that when you're compounding

concentrations, a small change in the trophic transfer factor makes a relatively large change in the output. So that's one example.

I don't know if that satisfies the question enough.

Q Well, so I think the concern potentially -- so there's been a lot of discussion around selenium. I think we understand your evidence pretty well on selenium. It's more about the other contaminants of potential concern. How confident are you with respect to those trophic transfer values, that they're conservative?

A So the bioconcentration factors that have been applied within the multimedia model are generated from the guidance that the model was derived from, which is the office of special waste from the USEPA, and they are based on going from water into tissue, and they are chemical-specific. There -- there would be some, you know, small changes from a site-specific chemistry perspective that could modify those, but that model is pretty well-established, has been used in numerous EIAs, and is -- is well-known.

Q Okay. Thank you.

What's the likelihood that site-specific trophic transfer factors for Blairmore Creek, Gold Creek, the Oldman reservoir, or the end-pit lake could be higher than those used in the assessment, and what would

contribute to this occurring?

A There is always a -- a distribution within species of potential uptake. Our approach has been to review the available trophic transfer factors and apply a value that represents, you know, between the 80th and the 95th confidence limit of those values. So we've tried to be very conservative in that application, but, you know, there is a distribution on either end. We feel that we've captured the conservative end of that distribution. Does that mean you've captured every single species? That -- that is a question I can't answer.

And the second part of your question, I think, was -- if I have it right -- what could influence the trophic transfer factors to be higher; is that correct?

Q Yes, that's right.

A So the site-specific water chemistry could have an influence, particularly at the base of the food chain. So, you know, small changes in the chemistry could modify the uptake. Also, the -- the speciation of the compound itself could also influence the uptake.

Q Okay. Thanks.

Did you use different trophic transfer factors for lentic, i.e., the Oldman reservoir and the end-pit lake, versus lotic, Blairmore and Gold Creek environments?

A We did. What we applied for the lotic environment was based on some site-specific data or as close to it as we could get. So, for instance, for invertebrates, we applied a regression equation that's been developed by -- in the Elk Valley, so that population was felt to be relatively similar in its invertebrate community assemblage.

But the -- in the end-pit lake, we didn't apply that because it was based on a lotic environment, and we -- I think there is some uncertainty with respect to the invertebrate community that would be present there, and so we have applied a more conservative value.

Q And that answer would apply to species other than selenium or just selenium, so other COPCs?

A Just for selenium.

Q Okay. Can you explain how the assumption that aquatic-dependent wildlife receptors were assumed to obtain 100 percent of food sources from the habitat evaluated is conservative for small home-range species, such as benthic invertebrates, or for individual or breeding pairs of a listed species which may occupy a specific habitat for the entire breeding season?

A So the American dipper was the avian species evaluated that had the smallest range, and it still has a range of .2 hectares. I think what -- one of the things that's noted about a bird like the American dipper is

that they will forage depending on habitat availability. So moving up and down within the system is noted in the literature for that receptor depending on, you know, ice cover and -- and what might happen. So although the .22 is their -- their listed range, they're going to be adapting to the changing conditions of the environment. So to assume that they would spend, you know, 100 percent of their time only in one area, I think, is relatively conservative. They might return to that area for parts of their -- you know, their life cycle, but that they would only be eating food sources exclusively from that small spatial area is pretty conservative.

Q For a species, though, like a -- let's say a benthic invertebrate that lives in a small area the whole time, that wouldn't really be a conservative assumption; it would just be the way it is. Is that not correct?

A That's correct, yeah. And that's how we've assumed the model is set up --

Q Okay.

A -- so that they would receive those consistent -- consistently high concentrations.

Q Okay. Thank you.

Were the -- sorry. We may have covered this already, but I'll ask it again 'cause I can't recall. Were the risk calculations for contaminants of

potential concern, other than selenium and zinc, redone with the same adjustment to sediment ingestion made, and were the checks made for other errors?

A We did a reevaluation of the exposure ratios that were relatively higher in magnitude, and because that -- that change is proportional, it -- it was determined that it wouldn't have a -- you know, make a change to the conclusions. But we didn't rerun all the compounds.

As I noted earlier this morning, we had reevaluated with the -- for our own purposes, the -- updated data set, and that would have applied the correction that was made for bulk density, and there were no change to conclusions.

Q Okay. One moment.

So you indicated you kind of did a check with the new modelling data. Is that available in a format that could be provided to the Panel in terms of, you know, a summary table of the updated HQs?

A Just one moment, please.

Q Yeah.

A Yeah. We can -- we -- we can provide -- provide that. Just wanted to give some expectations on timeline. You know, would one to two days be sufficient?

Q I think that's probably workable, yeah.

A Okay.

Q Yeah. So just for clarity, then, we're looking for, you know, those recalculated HQs, you know, using the new modelling and incorporating any error checks you may have done. And if that is acceptable, we'll get a number.
A That's acceptable.
Q Okay.
THE CHAIR: And can we get a number for that?
MS. ARRUDA: Mr. Chair, Elaine Arruda. It would be Undertaking Number 28.
THE CHAIR: 28. Okay.
Q THE CHAIR: And my subject matter expert just wanted to clarify, those recalculated HQs would include both the air deposition pathway and the waterborne pathways; correct?
A Correct.
Q Okay. Thank you.
Okay. Okay. That eliminates a few questions, so I just need to figure out where to go next.
Okay. I'm going to ask a few questions just about migratory birds and listed species. So Benga identifies listed amphibian species, including the Columbia spotted frog, the long-toed salamander, and the western toad as being confirmed as present in the local study area. And Benga notes that these species

are rated as "sensitive" in the Alberta -- sorry, are rated as "sensitive" in Alberta and that the western toad is rated by the Committee on the Status of Endangered Wildlife in Canada, or COSEWIC, as "special concern".

In CIAR 334, the Canadian Parks and Wilderness Society stated that: (as read)

> Risks to amphibians are not properly considered by the use of only mammalian or avian surrogates.

Benga identifies three listed bird species which feed on insects with aquatic egg larval, pupae, or nymph stages as being confirmed as present in the local study area. These species are barn swallows, common nighthawk, and olive-sided flycatcher.

Barn swallows and common nighthawk are listed as "sensitive" in Alberta, rated as Schedule 1 under the Species at Risk Act, and are rated as "threatened" by COSEWIC.

The olive-sided flycatcher is a Schedule 1 Species at Risk Act species and rated as "threatened" by COSEWIC.

Teck monitoring data provided in CIAR 313, Addendum 11, Appendix 6.19-3, page 1083 showed that of 46 mine-exposed areas in 2018, five had mayfly, stone fly, or caddis fly abundances less than the normal

range observed in reference or non-mine exposed tributaries.

In CIAR 360, Table 7.1-5, PDF page 17, selenium exposure ratios greater than 1 were recorded for American dipper and mallard exposed to the end-pit lake and for mallard exposed to Gold Creek. American dipper and mallard can both be assumed to consume the aquatic forms of the same insect species which later emerge and are consumed as adults by barn swallows, common nighthawk, and olive-sided flycatcher.

Finally, Benga states that it will rely on the recovery strategies for species at risk that are developed by Environment and Climate Change Canada and departmental advice to develop mitigations and monitoring programs.

Benga notes that federal recovery strategies exist for olive-sided flycatcher and common nighthawk and that these strategies plus any future federal action plans will form the basis for project mitigation and monitoring plans.

So with that background, I'm going to ask a series of questions regarding the implications for Species At Risk and the Migratory Birds Convention Act.

THE CHAIR: So, Zoom Host, could we go to CIAR 89, PDF page 602? PDF 602.

Q THE CHAIR: So the first two paragraphs on

this page includes information based on literature citations regarding the potential of selenium, nitrate, and nitrite concentrations to negatively affect the Columbia spotted frogs and other amphibians, including larval deformities, hormonal abnormalities, increased mortality, reduced feeding, and increased susceptibility to predation.

If we could turn to page 604. In Section 11.2.2.3, under the heading "Change in Mortality Risk", Benga includes information based on literature citations that includes -- that indicates that increased concentrations of selenium, nitrates, and nitrites in waterways downstream from the mine have the potential to cause mortality or deformities in western toad larvae.

THE CHAIR: And, finally, can we go to CIAR 313, PDF 1088? Looking for PDF 1088. Thank you.

Q THE CHAIR: And the information on this page includes information from Teck regarding recent studies of nitrate, sulphate, and selenium toxicity to amphibians.

So in light of the information that we just looked at, why did Benga feel it was not necessary to conduct an assessment of risk to amphibian species?

A MS. MOONEY: So guidance in the literature, including the USEPA's 2016 surface water criteria and

BC's 2014 water quality criteria for selenium, indicate that for wildlife, egg-laying vertebrates are the most sensitive receptor and, of those, birds.

Amphibians are important and certainly a receptor. Often, data limitations, specifically the daily threshold exposure dose that is required to quantify risk, are lacking for amphibians. And in this case, because the literature recognized that birds are the most sensitive, if birds are sufficiently protected, so too are amphibians, not to say that amphibians aren't receptors and -- and wouldn't be receiving exposure, but if -- if birds are protected, then so too are amphibians.

Q Okay. Thank you. One moment.

So the sensitivity is one thing. Then, of course, there's the degree of exposure. So would amphibians not be expected to have higher levels of exposure than birds?

A I think it would depend on their diet. So if the amphibian is consuming a large proportion of fish, they would receive higher levels of exposure, but so are the pescavorian birds. So -- and because the -- the daily threshold exposure dose for avians is well-studied and supported over numerous regulatory documents, and there just isn't that data right now to understand the -- the analogous daily threshold exposure dose for amphibians,

they -- they weren't able to be evaluated. And if -- and if that data, you know, was generated or comes -- becomes available in the future, I think it -- it could be something that definitely adds value to the risk assessment.

Q Okay. Given that there is, apparently, from the record, available information for selenium, sulphate, nitrate, and nitrite, why did Benga not at least assess those specific COPCs for amphibians?

A Again, because birds for selenium are defined as the critical receptor, and in -- recognized in the guidance as the most sensitive, they -- they were evaluated, and if they are protected, so too are amphibians.

Q Okay. Just one moment.

Okay. So just to clarify. What I think I heard you say was that, you know, it's your opinion that even though amphibians may have potentially higher exposure than birds, if birds are protected, amphibians are -- are protected as well. Is that what I heard?

A Sorry. I was on mute.

Q Yeah.

A Based on our understanding currently of birds being the critical receptor, yes.

Q Okay. Thank you.

So I'm going to move on to a different topic. So can we pull up CIAR 313, and I'm looking for page 1342.

Okay. So there are two tables here that I just want to ask about. Before I ask my questions, I want to clarify whether there might be a mislabelling of the two tables.

And so this is Table D4, and it indicates that it's "Predicted Exposure Ratio for the Multimedia Assessment for Gold Creek".

And if we go to the next page, 1343, there's Table D5, and it indicates it's "Predicted Exposure Ratios for the Multimedia Assessment for Blairmore Creek".

So my first question is: Should the table caption for D4 actually be "Blairmore Creek" and the table caption for D5 be "Gold Creek"? And the reason I ask is that it would seem that Blairmore Creek would have more hazard quotients greater than 1 than Gold Creek. But that's not the way the tables appear.

A We're going to check on that and get back to you.

Q Okay. So my question will depend on that, so I won't ask it. I'll just move on till you confirm that.

Okay. Let's move to a different topic, then -- or related topic. So in CIAR 42, Appendix 10, PDF pages 266 to 268, Benga indicates that three surge ponds that receive runoff from waste rock are predicted to have elevated water quality parameters and presents results for sulphate, nitrate, cobalt, selenium, and

zinc.

Could Benga confirm that the predicted concentrations of all five of these parameters, as illustrated in CIAR 42, Appendix 10, PDF pages 266 to 268, are above water -- Alberta water quality guidelines and, if so, by how much for each parameter?

And if you want to pull up that reference again, it's CIAR 42, Appendix 10, pages 266 to 268.

A MR. HOUSTON: So, Mr. Chair, I can confirm that, and -- and they're orders of magnitude difference. For example, selenium, in some cases, is in -- in the order of 1 milligram per litre, so that would be a thousand -- or 500 times the -- the two micrograms or -- several hundred times the -- the site-specific limits we're talking about for Blairmore Creek. So these -- these are quite high numbers.

Q Okay. Thank you, Mr. Houston.

And so this relates to a matter that Mr. Yewchuk raised the other day, and we did talk a little bit about it when he was cross-examining you, but could Benga comment on the potential risk to amphibians from exposure to the surge ponds during operation as well as long-term exposure in the postclosure period?

A Yeah. So we -- we did discuss this with Mr. Yewchuk, and -- and absolutely exposure to these ponds would not be healthy for amphibians, and so we talked about

putting in place traps for the amphibians and -- and relocating them away from these -- these sites.

Mr. Kansas, can -- can you just talk a little bit more about that? You're on mute, John.

A MR. KANSAS: I -- I think -- I think we covered it with -- with Mr. Yewchuk. I -- I can't add to that.

Q Maybe just a follow-up question, then. You know, when you think about trapping, how would long-trap -- how would long-term trapping and relocating work?

A MR. HOUSTON: So we --

A MR. KANSAS: The -- oh, sorry. Go ahead, Gary.

A MR. HOUSTON: Yeah. No. We talked about pit traps, Mr. Chair. So -- and not being a frog expert, but my understanding is the frogs get caught in the -- in the pits, and it would require somebody to be monitoring them on a periodic basis to, you know, remove the frogs from the pits and -- and to relocate them to another site that was conducive.

We were asked about the frequency of checking, and -- and my answer to that was: Well, it would depend on the season, on -- and on the -- the number of times we checked and found actual frogs, or if -- if -- you know, so we would -- we would vary that frequency depending on the situation.

A MR. KANSAS: I can add -- I can add that this won't stretch me out -- outside my expertise, but movement of adult frogs and amphibians in general is a standard practice. It's not something that's disadvantageous to the -- to the animals. It's -- it's pretty standard. I just haven't been involved in -- in -- in -- in it very often.

Q Okay. Thank you.

So what are the implications of exposure ratios greater than 1 for American dipper and mallard regarding risks to the listed species with similar diets -- so we're thinking the barn swallow, common nighthawk, and olive-sided flycatcher -- given the level of protection appropriate to listed species? So, again, worried about potential contamination from the surge ponds affecting the diet of other listed species.

THE CHAIR: And, Zoom Host, you can take down that previous exhibit.

A MS. MOONEY: Lindsey here.

So for the surge ponds or the operating water habitats during the mine that are above criteria, there would be exposure control for birds to prevent contact with the water and hopefully to prevent ingestion of food sources from those habitats as well.

With respect to the listed species that you

provided, you know, risk is a function of the receptor-specific characteristics, and while we haven't evaluated those species in particular, we have evaluated a pretty close surrogate. So the American dipper is a small bird that eats also a lot of insects and has a -- relative to its body weight would likely have a similar food-ingestion rate. And we have a low magnitude of risk predicted in the end-pit lake. But the other habitats for those species were below the risk threshold.

Q Okay. Thank you. Just a moment.

So I specifically asked about the surge pond, but in terms of Blairmore Creek and the end-pit lake exposure as well, they have a close surrogate that also has an exposure ratio greater than 1. And given that the level of protection to listed species is not limited to populations but also includes individuals, how do you see that issue in terms of risk to those individuals?

A I'm not entirely sure about the -- some of the receptor-specific parameters for those listed species. But I think, again, the layered conservatism that we've applied for species that -- with -- that would be -- that would be considered a similar surrogate, given that we have assumed that those similar surrogates would be expected to, you know, only receive food

foraged from a specific location under these conservative assumptions and sort of the numerous levels of conservatism that I noted earlier, that -- that those listed species would likely be protected as well.

Again, risk is a function of the specific receptor characteristics, and I'd -- we'd have to evaluate those specific receptor characteristics. But I don't expect them to -- to change the conclusions.

Q Okay. Just a second.

So given that the -- I think I heard you say the American dipper is a close surrogate and that the ER is greater than 1. Wouldn't that trigger a particular concern for a listed species that have a stricter definition of "acceptable risk"?

A So receptor surrogates are partly chosen due to the availability of defensible receptor characteristics, and they're believed to be conservative across similar species, which is why they're run as -- for that specific feeding guild, which is why they're run as the surrogate. So, yeah, I think the answer to your question would be: No, I wouldn't expect that there would be significant differences for different birds within the same feeding guild.

Q Okay. My wildlife specialist wants to just return briefly to the issue of trapping and relocating of

amphibians. It seems that that would be required over a prolonged period of time and potentially into the postclosure period. Does Benga think that that's a workable solution over a long period of time?

A MR. HOUSTON: Yes, Mr. Chair, we -- we will have routine duties to perform to maintain the water management system in any case, and so I -- I think it will be workable to hire somebody, if that's what it takes, to monitor the -- the -- these traps, and -- and we -- we would also expect that at some point during the life of the, you know, monitoring after operations that we would be able to close those surge ponds. And so there -- you know, even though we may still be pumping water to the saturated backfill zone.

So there -- there would be some -- you know, there would be an end point where we would close the surge ponds and -- and not have to do that. But, in any case, having -- having somebody on a local contract to maintain these traps, I -- I don't think is, you know, unreasonable.

A MR. BARTLETT: Mr. Chair, it's Mike Bartlett.

Just to add to that, the -- the traps are just one of the mitigations that were in place. I think they would be supplemented, or the primary one would be exclusion fencing, and those are often used long term on industrial sites.

Q Okay. One moment.
A MS. MOONEY: I also have an answer about the D4 and D5 tables.
Q Okay. Yeah.
A And they are not flipped. And --
Q Okay.
A -- just to qualify that the Blairmore Creek values here, remember, they applied the older data set.
Q So if they applied the newer data set, would the numbers change substantively?
A They don't change substantively in terms of conclusion, no. That's the answer.
Q Okay. And what accounts for the higher number of HQs -- elevated HQs in Gold Creek versus Blairmore Creek?
A So there's two things. So the relative concentrations that were used for Gold Creek didn't change significantly from what has been applied in these tables in the updated data. The larger change was for Blairmore Creek. Specifically for selenium, the higher hazard quotients have to do with the lower contribution of sulphate to Gold Creek.
Q Okay. Thank you.
Okay. So this is the follow-up I was going to ask about following the clarification on the table. So we've covered a bit of this, but I'll ask it anyway.

So if risks to amphibians can be assumed to be similar to those for aquatic-dependent mammals and birds used in your risk assessment and given that selenium exposure ratios equal to or greater than 1 are predicted for American dipper and mallard duck in the end-pit lake, northern river otter, American dipper, great blue heron, and mallard duck in Gold Creek, and mallard duck in Blairmore Creek, could Benga comment on the potential risk to amphibians from exposure to end-pit lake, Blairmore Creek, or Gold Creek water based on the values in those tables?

A Yeah. I -- I think what's important to remember about the values that have been presented is, you know, they have been presented providing the upper distribution of possible exposure as a tool for us to better understand and -- where mitigation may be required.

With respect to the amphibians, the same answer holds, that we know we've got some exposure ratios for birds that are higher than -- than the threshold, and -- and it's not a line in the sand. You know, 1.1 versus .9 is -- is not significantly different. But it is something that needs further evaluation and, you know -- yeah.

Q Okay. Thank you. Just a minute.

What specific mitigation would be required to reduce the risk of exposure to contaminants of

potential concern in listed bird species, again, barn swallow, common nighthawk, olive-sided flycatcher? Are there any specific mitigations required?

A MR. HOUSTON: So, Mr. Chair, again, the -- the lens that Ms. Mooney's looking through is -- is a -- a screening lens, and so we've taken conservative assumptions that, and -- and that has driven our -- our understanding of where the risk lies.

In -- in terms of some of the project water bodies, like the surge ponds you mentioned, we -- we would employ mitigations like fencing pits for the amphibians and noisemakers or -- or flags or something to have the birds stay away. So that -- those are the kinds of mitigations.

But in terms of water quality in -- in the -- in the creeks, the -- the -- the same mitigations would apply; that is, water treatment, monitoring, and management -- active management of -- of those water bodies to -- to ensure that no harm is done.

Q Okay. Given the exposure ratio's greater than 1 predicted for Gold and Blairmore Creeks, what are the implications of these results, given that there are species covered by the Migratory Birds Convention Act?

A Again, I'll -- I don't want to speak for Ms. Mooney, but we've talked about the conservatism that goes into these studies, and especially if you're talking about

migratory birds, they're not going to stay in one place and -- and drink the water for -- for a lifetime. So I -- I -- I think that the -- the screening-level study that we've done is -- is very conservative for -- for migratory birds.

Q I guess the question was really more about: Given the potential impacts to migratory birds, is there a need for additional level of protection or mitigation? Like, I understand that the assessment is conservative. The assessment shows the potential for some effect, which may need to be considered, and so I guess what we're looking for was: Are there any specific mitigation measures as required by the Act to protect migratory bird species?

A I -- I think the only mitigation that we would consider in that -- in that light would be the -- I'm sorry. I'm having trouble thinking of the word, but the -- the systems around the surge ponds to -- to disincent the birds to land -- from landing there, and -- and that's where the -- the levels of selenium and nitrates would be quite a bit higher than the -- than the guidelines for a natural water body. So we would have a disincentive system for -- for the migratory birds at those ponds.

But outside of that, I -- I -- I think that the actual risk, especially if we're talking about

Blairmore Creek and Gold Creek and a migratory bird that is spending a short time in that vicinity, I -- I think the risk is very, very small.

Q Okay. Thank you, Mr. Houston.

Just the last couple of questions now. So the guidelines for the preparation of Benga's environmental impact statement require that the cumulative effects of the project are assessed using the technical guidance for assessing cumulative environmental effects under the Canadian Environmental Assessment Act. The guidelines for Benga's EIS state on page 37 that: (as read)

> A cumulative effect on an environmental component may be important, even if the assessment of the project's effects on this component reveals that the effects of the project are minor.
>
> On the same page, the guideline requires that Benga consider surface water quality, fish and fish habitat, including westslope cutthroat trout, mountain whitefish, as well as other valued fish species; migratory birds, including habitat loss and contaminant exposure; and species at risk.

The CEAA, C-E-A-A, technical guidance for assessing cumulative environmental effects states that:

(as read)

With complex interactions, the whole does not necessarily correspond to the sum of the parts. [The guidance goes on to state that] Continuing environmental changes associated with past and existing activities may result in a worsening or improvement of VC conditions and that where there is evidence that effects are not simply additive, it should be noted.

So the first question is: According to CEAA technical guidance for cumulative effects assessment, consideration of simultaneous exposure to several stressors should be considered. This guidance is illustrated with an example at the bottom of the page, which is page 40 of the guidance document.

Could we pull up CIAR 313, PDF 1343? So these were the same tables we were referring to earlier.

Given the technical guidance regarding consideration of the effects of a combination of stressors on each valued component, could Benga comment on the risk to wildlife of exposure to all combined contaminants of potential concern? Could Benga include in the response specific consideration of effects of the combined exposure to contaminants where exposure ratios for each contaminant may approach or exceed 1

for long durations, for example, a combination of selenium, methylmercury, and thallium as indicated on PDF page 1343; and could Benga also include consideration of the level of protection required for species at risk and migratory bird species?

So, again, long question. The essence of it is considering the potential for being exposed to multiple contaminants approaching a hazard quotient of 1 and having regard for the at-risk nature of these species, what are Benga's comments on that potential combined effect?

A MS. MOONEY: One moment.

So when we look at these con -- or these, sorry, exposure ratios that have been produced, selenium has the end point of hatchability, but if we were to sum the others that you had mentioned, it doesn't actually change anything. We don't come close to exceeding the threshold. So I think selenium is its own COPC, based on its defined and specific end point for birds, but I -- I don't think that, you know, summing the remainder would make a significant change to the conclusions.

Q Okay. Thank you.

Could Benga comment on the potential risk from a combination of exposure to several contaminants as well as degradation or elimitation [phonetic] of -- sorry,

degradation or elimination of habitat? For example, which specific combinations of contaminant exposure and habitat effects are most likely to cause adverse effects, particularly listed species?

And you can consider amphibian species as well as bird species in the answer. So habitat loss combined with contaminant exposure.

A So my understanding is that there is a hundred-metre offset for the riparian habitat. So with respect to habitat loss, specifically for aquatic species, I -- I don't know if there is any habitat loss expected for the wildlife, including amphibians. So in terms of a cumulative assessment, I think it would be strictly relegated at that point to just the chemical exposure, which is what we've done.

Q So I think I understood from the discussion the other day there is a significant loss of a treed wetland, although it's a bit unclear about how many amphibians that it includes because an assessment was not done, but that's the kind we're looking at -- we're wondering about, loss of that kind of habitat with contaminant exposure to amphibians and how those two risks would combine.

A I can say that -- so for that wetland that was used as an example, it is -- it's not connected to the drainage of the creeks that were evaluated, and it would

primarily be receiving aerial deposition, which is, you know, less than 1 percent of the total concentration that we've evaluated.

So I think the cumulative effects would be very low in terms of, you know, air deposition and potential habitat loss. And what -- what we have evaluated is the surface water habitats, the creeks, where predicted concentrations are higher due to that connection with the -- the discharge. So -- and there is no habitat loss predicted in those areas. So, again, I think it would be in those spots related mainly to the chemical exposure.

Q Okay. Maybe just a follow-up question, then, for Mr. Kansas.

Mr. Kansas, do you see and has Benga considered, you know, any scenarios where wildlife might, I guess, be exposed to a number of different effects, so both habitat loss and contaminant exposure?

A MR. KANSAS: It's just really out of my area, the whole contaminant game. I -- I don't ever touch it, so it's throwing me off a little bit here, but I -- I think the wetland that you're referring to that we didn't sample, that -- yet it will be removed, that type of a wetland would probably have attracted dispersing Columbia spotted frogs to it. However, that could be deemed as a cumulative effect, but only if the

Columbia spotted frog was under pressure from a chemical -- a toxicology point of view at the same time, which I don't know we've -- we've determined.

However, the treed wetland that will be removed, as I understand it, is going to be replaced at the surge ponds or sediment ponds -- will -- will create additional treed wetland habitat. So there should be, in -- in essence, a -- a neutral effect on -- on that species from multiple stressors.

Q Okay. And what about a concern of habitat that may attract wildlife such as amphibians but has contaminants associated with it? Has Benga considered that in its assessment?

A I think we've been speaking to that, trying to keep animals off and away from the -- the toxic water through various means, radar-controlled cannons right through to flighting tape, just keeping them off the -- off the sites.

Q Okay. So last question on this topic and last question, I think, totally. Has Benga considered situations where cumulative risks may require a change in mitigation strategy because of additives synergistic or antagonistic interactions among stressors and, if so, how?

A MS. MOONEY: So aligned with what I had said before that, you know, the end points that we've

evaluated really aren't appropriate for additive -- to be added, and if you had added the hazard quotients, other than selenium, we result in an exposure ratio that's still quite low.

And I don't know if there is a lot of documented information with respect to synergies as opposed to just being additive in the -- the toxicological data that we've applied for these species, mammalian and avian, but I -- I don't really expect so, and, you know, I think kind of based -- based on what I was saying before about, you know, even if we had added some of the exposure ratios, you know, it -- it doesn't change the conclusions. So I -- I think that addresses at least some of the question.

A MR. HOUSTON: Mr. Chair, if I could just add on a little bit. We have committed to a wildlife monitoring program, and we've also committed to an Indigenous-led monitoring program, which we expect will get -- lean heavily into the -- into the wildlife health area. And so, you know, we will be watching for unforeseen consequences, and should -- should those be detected through one or the other of those monitoring programs, then, yes, we would be looking for -- to -- to apply other mitigations to prevent that from happening.

Q Okay. Sorry. One last follow-up question, then. Is

Benga aware of any cumulative effects modelling tools which allow for a consideration to both habitat-related stressors and contaminants?

A MS. MOONEY: I am not personally. That doesn't mean they -- they don't exist. I just -- I'm not aware of them.

Q Okay. Thank you.

Okay. Panel, thanks. Those are my questions. I'm just going to turn to Mr. Matthews and Mr. O'Gorman to see if they have any additional questions.

THE CHAIR: Mr. Matthews, do you have any questions for this panel?

Q MR. MATTHEWS: Good afternoon, panel.

I have a few questions with regard to community health, more specifically, Indigenous health. I recall, I think, Mr. Mitchell talked about using Statistics Canada 2013 data. I think it's referenced to Zone 1 where I think he was -- there was mention that there were 300,000 people living there.

But just wondering if you -- if you had any statistics on community health -- or, sorry, Indigenous community health in that area.

A MR. MITCHELL: Give me just one moment on that.

Q Okay.

A I don't think we're aware of any studies that are

specific enough to that sort of stale community and also include enough data to be -- to be meaningful.

Q Okay. 'Cause I was -- I was curious as to how Benga would -- or -- or how -- what tools they would use to monitor community health when they have no -- or very little baseline data on each of the communities and their mental and physical health.

A MR. HOUSTON: So I've spent a lot of time with the Indigenous communities in the area, and it's hard to -- from a health point of view, it -- it's hard to make a direct correlation between the project and -- and the community health or -- or the health statistics within the community. There are so many other factors, you know, impacting on health that I think -- I think it's an area that we would like to get into more with, especially, our closest neighbours and -- and perhaps work with them to investigate, but it's -- it's -- it's difficult to incorporate into a formal study like this.

Q Okay. 'Cause I'm just -- you know, obviously it was mentioned that the environmental management committee would play a role or the stewardship committee would play a role, but how would you determine whether your project has -- is negatively affecting an Aboriginal community's health?

A I -- I think a big part of the -- the answer to that question is open communications with -- with the

community through the leadership and -- and through other -- other channels that are more at the base of the community. But it's -- it -- it is a difficult question to answer, so we would look more for -- not -- not just complaints but comments, attitudes towards the project, and -- and combine that with, you know, information that comes out of a -- an Indigenous-led monitoring program. But it -- it -- it is a tough one to get a -- a handle on.

A MR. MITCHELL: Just a couple additional comments, if I may, related to that. And what we're talking about is sort of the -- I guess the physical health that the traditional human health risk assessment looks at and, you know, significant health effects.

I think the comment came up about the studies in the Appalachian region and how there's just so much noise in those studies that they couldn't really come up with anything -- anything conclusive, and we were talking about a -- about a smaller population again, unless you had a really significant health effect, there would probably be too much noise to actually detect it from, you know, measuring incidents of cardiovascular disease or -- or cancer and anything like that, and that's why we need to rely on the -- things like the -- the air monitoring and the public

communication to make sure we don't get to the stage where there is a risk of that, because by the time you could detect it, it would be too late, really.

Q Yeah. 'Cause, I mean, just -- I'm just thinking out loud here, but if you did have the baseline data on, let's say, cancer rates, diabetes, mental health issues, as my colleague mentioned, potential toxicity of the kidneys, liver, and all these other elements, it would be very difficult to determine what kind of an impact your project is having on the community health. So I -- I'll just -- I'll just throw that out there and just -- just something to think about.

A Yeah. It is difficult. Even -- even if there is an observable change relating it to a specific cause as opposed to, say, a change in lifestyle, a change in diet, a change in the community composition, it -- it becomes very difficult, and, like I said, that's -- that's why -- obviously when you get that information, it's -- it's important to -- to incorporate it, but it's -- it's very hard to actually get meaningful, good data on.

A MR. HOUSTON: I think the other thing, Mr. Matthews, that -- that is -- has to weigh in here is the nearest Indigenous community is, like, 50 or 60 kilometres away, and so it's -- it's not like Fort McKay, that's, you know, right in the middle of

several projects and directly experiencing the -- the air -- our air models don't even go out that far. And so when you think about typical diseases that might be because of air pollution or water pollution, we don't have that effect on these communities.

We've modelled individuals that may choose to stay close to the project and do their foraging close to the project, so we've modelled them in, but it's not -- it's not, you know, a -- a -- a general thing to -- to say that the community's exposed to the project in that way. It would be more a social, psychological, other -- other kinds of health that I think would be the vectors that would -- would have the biggest effect in the community.

Q Okay. Well, thanks -- thanks for your answers, and I have no other questions. Thank you.

THE CHAIR: Mr. O'Gorman?

MR. O'GORMAN: Thank you, Mr. Chair. I do just have a couple of areas of questions for this panel.

Q MR. O'GORMAN: So good afternoon, panel --

A MR. HOUSTON: Good afternoon.

Q -- Mr. Houston.

A Good afternoon.

Q So the first one is a question about greenhouse gas emissions. I'm guessing Mr. Rudolph might be your

expert for this, but -- is that right?
A MR. RUDOLPH: Possibly. I'll do my best to answer them, Mr. O'Gorman.
Q Okay. Thank you, Mr. Rudolph.
So not a hard question.
MR. O'GORMAN: I'll say the reference, but Zoom Host, you do not need to haul this up.
Q MR. O'GORMAN: So in Addendum 10, which was Registry Document 251, Package 1, near the end of that document --
MR. O'GORMAN: Don't haul that up, Zoom Host.
Q MR. O'GORMAN: Near the end of that document, final ten pages or so, in response to a request, you gave us -- Benga gave us a greenhouse gas management plan. In there, there were a couple of references to the -- Alberta's Carbon Competitiveness Incentive Regulation. Do you recall that?
A MR. RUDOLPH: I do, yes.
Q Okay. So I'm sure that you're aware that since the time that was submitted, there's a new provincial greenhouse gas regulatory framework, the carbon competitiveness -- Carbon Competitiveness Incentive Regulation has been replaced by the TIER program, the Technology Innovation and Emissions Reduction Regulation. You're aware of that; right?
A Yes, that's right.

Q Okay. So obviously the references, you know, in the greenhouse gas management plan presumably would be updated to reflect the new TIER program. That's not a huge issue.

We are interested, though, in whether or not you have calculated the -- for any year of the project's operating lifetime, some early years, Year 19 which was the year that, you know -- your highest GHG emissions estimated year, for example. Have you calculated what you anticipate the compliance obligation to be for your project, whether that be measured in tonnes or in dollars?

A No. I don't think we've done the benchmarking yet for -- for the project, Mr. O'Gorman.

Q Right.

A I did -- I did note, though, and I -- I probably should've mentioned it earlier in the -- in the conversation when Mr. Lambrecht was talking to Mr. Houston, that mine-face emissions of methane would likely be included as one of the sources under the TIER program. But they would not be considered a process source per se and, therefore, would not be subject to the 1-percent-a-year emission reduction requirement. And I -- and I know that -- you know, it's not necessarily the case that -- that Mr. Houston would not commit to some form of reduction, but I think it's a --

I just wanted to point that out.
Q Okay. Fair enough. Thank you.
So you haven't actually done an estimate of the compliance obligation. Do you have a sense of whether or not the compliance burden the project will face under this regulation is higher or lower than it would have been under the previous regulation?
A We haven't done that assessment at all, to my knowledge, Mr. O'Gorman.
Q Okay. Okay. And I'm assuming you don't have a -- you don't have a strategy yet for how you will satisfy your compliance obligation, i.e., payments into a fund versus offsets versus on-site emission reductions, or do you?
A MR. HOUSTON: So I guess all those options are -- are open to us at this -- at this point. The -- roughly a third of the greenhouse gas emissions attributable to the project are for electricity generation. So one of the potential wins, I think, we see is to perhaps find a greener source of electricity to offset those -- those emissions associated with the electricity use. But no -- no concrete plans at this moment. Just a thought process.
Q Okay. That's good for that area. Thank you, gentlemen.
So my second area I want to ask questions about --

I will haul up a couple of references in a second. But, first of all, I'll ask you, Mr. Houston, who on your panel today -- I suspect I know the answer, but I'll put it to you. So who is the person most familiar with and can speak to the measure you folks have -- like, the actual on-the-ground implementation of the road dust watering system that you would implement?

A I think it would be Mr. Rudolph that could speak to what -- what is incorporated in the air modelling.

Q Okay. I'm more talking about -- look, so Mr. -- I was guessing Mr. McCoy.

So what I'm wondering is which one of you or has anyone actually been on a mine site and watched road dust monitoring take place, and can you describe it to me?

A Mr. McCoy might be a good candidate for that, but I think Mr. Rudolph might also have that kind of experience.

Q Is that right, gentlemen?

A MR. MCCOY: Well, I -- I have been on a mine site, and -- and, you know, watched road watering occur. So, I mean, we can take that -- I can take a stab at it, Mr. O'Gorman.

Q Sure. Let's start with you, and you guys can figure out how best -- Mr. Houston, it might also fall back to you.

So let's start with -- I'm going to suggest that there -- you haven't provided us with a whole lot of information about what that measure would look like. You've implemented -- you've said you will do it as a mitigation measure to manage road dust, but can you describe it a bit to us, Mr. McCoy or Mr. Houston? Like, what does it look like? How -- it's -- is it big trucks? How big are they? How many are they -- are you using? Tell us a little bit about what that looks like, please.

A So most of the mines -- well, there's a combination. You can use a -- a typical water truck that would, like, haul water to an acreage, for instance, but -- but most of the mines have -- have modified or retrofitted some of their big coal haulers with big water tanks on them that actually can get more range out of it so when they're actually dispersing the water, they -- they could get, you know, from one end of the mine to the other then go back and sort of reload with water. So it's a -- it is a, you know, 200-tonne truck capacity full of water that would be -- would be spreading the water evenly out over the -- over the haul road, so ...

Q Okay. And what roads, to be clear, are we talking about? I think I know the answer, but I'll let -- I'll let you tell me.

A That -- that -- that would largely be a -- for the -- for the coal haul road, so from the -- from the -- from the pit base area to the -- to the CHPP would be a few roads that would be watered, and also the -- the roads that go from the pit face up to the external rock disposal areas. So roads that are being traversed with -- with those waste haul trucks would -- would -- would be watered as well. That -- those would be the ones that -- that would get the -- the lion's share of the -- of the watering and the attention, so ...

Q Okay. So a good -- a good amount of that water is being used in the pit along the roads back and forth between the CHPP and where you are mining at a particular point in time; right?

A I -- I -- I would say that, you know, wherever waste rock is being hauled or -- or coal hauled back to the plant, both of those probably get equal attention --

Q Okay.

A -- so ...

Q And I'm guessing not -- or correct me if I'm wrong -- probably not a lot of watering, or -- or is there, of the mine access road from Blairmore up to the CHPP area? Or is that one also going to receive some lot -- like, how much watering would that get?

A Well, I -- I -- I think the -- the -- the -- sort of the -- the mechanics of what I was just describing

would be for on the mine. For off the mine, I would suggest that -- that that equipment is -- is too large and wouldn't be capable or acceptable on a -- on a -- a sort of public road like that. That would be more of a -- a conventional water truck that would -- would -- would be used in those instances.

And I -- I -- I think it -- it really varies from -- from mine to mine. And -- and I do know that there has been some talk about -- about supplementing the dust suppression, and -- and there's various methods for doing that, and Mr. Houston has talked to that in -- in the -- some of the previous discussions, but -- so -- and, anyway, so on the mine, it would be -- be -- be the larger trucks that would be hauling water. On -- on -- off the mine, it would be a different sort of configuration.

Q Okay. So thank you, Mr. McCoy.

MR. O'GORMAN: Zoom Host, I'm going to ask you please to haul up the first of the two documents that I sent you, which was the transcript from Friday. I think it's -- I'm not sure what the CIAR number is, but the Volume 26, November 27 transcript. And the page number I'd like you to go to is 5641, please. Right.

Q MR. O'GORMAN: So, Mr. Houston, you were having a conversation with Ms. Janusz, and this

exchange took place on Friday. She was talking about -- well, she was reading something you had said earlier. I didn't go back and look for the early reference, but she was reading, you'll see there. You talked about there being a wash bay to clean the equipment, as she was asking about water use. You said you're committed to doing a wash bay; that's something that's using water. You also then said down that line -- line 7, "Another --" sorry, starting at line 8: (as read)

> Another one -- another use would be spreading water on the roads to keep dust down. [And you said] So that is, actually, you know, not an insignificant use of water.

You recall saying that, Mr. Houston?

A MR. HOUSTON: Yes, I do.

Q She was quoting you here, but I'm -- I'm didn't go back and -- I didn't do the double reference. It was too meta for me.

MR. O'GORMAN: So, Zoom Host, can we haul up the other document I sent you, which was Addendum 2, CIAR 53, Appendix 1E, and we're going to go -- well, when I see that up, we're going to go to PDF 8, please. Scan in on the table at the bottom, please, Zoom Host, so we can see it a bit better. And scroll down to the bottom.

Q MR. O'GORMAN: So you gave us an estimate in here -- in your water use application of wash -- I'm assuming wash -- the column that's "Wash Down Makeup Water" in cubic metres, the 2,000 cubic metres per year, that's notionally your wash bay water. Is that right, Mr. Houston?

A MR. HOUSTON: I -- I believe so, but I'm -- I'm just going to check with Mr. McCoy to see if he knows anything different.

A MR. MCCOY: I -- I believe that's what that was meant to account for.

Q Yeah, which -- that would make sense. So 2,000 cubic metres per year. That's like 2 million litres; right?

A That's correct.

Q Okay. So we looked and did not find anywhere in your document where you have told us how much water you anticipate using for the wash -- the -- I'm sorry, the road dust spraying program. Based on -- now -- so I'll invite you to tell me if we missed it and where we could find that amount, and if you haven't, is there -- can you give me an estimate of what that might look like? And the reason I hauled this up is, of course, you know, in the conversation you had, you -- you -- you talked about the makeup -- the wash bay water and then the road dust water is -- you spoke about them in the same sentence, so is it the sort of thing where you

expect them to be about the same? I don't know. We don't have any estimate of how much water you're talking about for the road dust, unless you can show me where it is.

A I can -- in a -- in an earlier version of this, the -- the -- the -- the assumption was that we would use about 60,000 cubic metres of water per year -- or per road watering, and I -- I don't know off the top of my head where that reference is, but I -- but I do know that in the initial water balance, that was the -- the estimated volume that was -- was proposed to be used, so ...

Q Okay. 60 million litres per year in road dust watering?

A Correct.

Q Okay. Is that the sort -- and, Mr. McCoy, in -- again, as I -- I'm -- I'm thinking you're the one who's seen this happening on mine sites. Is that sort of an amount that you would say is comparable to other mountain -- mountain -- you know, mountain coal mines? Is that the -- sort of the ballpark? Is that significantly higher, significantly lower based on your expert judgment?

A I -- I would say that it seems reasonable, you know, just given the -- the -- the length of the haul roads and the amount of watering that would -- would likely

need to be done. I've also been on some mines that have, you know, 40, 50 kilometres of haul road that need -- there's a lot more road that needs to be watered than what -- that what we would have at -- at Grassy. So I -- I would say it's -- it seems like a reasonable amount of water --

Q Okay.

A -- (INDISCERNIBLE).

Q So I wonder if you folks, whoever, can tell me how that water is managed? What happens to it once you spray it on the roads? Does it sit there and just evaporate? Does it run off? Where does it run off? Are you managing it in any way?

A So the -- the idea is we're -- we're -- we would be spraying this on the haul road. So our -- our -- our -- our retrofitted haul truck would have a -- a -- a water tank on the back, and it would have a spray bar on the back of it that would, you know, drive down the -- drive down the haul road and -- and spread the -- the water sort of evenly across the -- across the road. And -- and once it's on the road, there would be -- it would be -- it would be left there to -- to help. You know, we would -- we would put the appropriate volumes on, I guess, so that it would -- would keep the dust down for a -- for an extended period of time, and then it would just -- it would just

go from, you know, across the -- the -- the roads that would need watering, and then once he was -- once the truck was empty, it would go back to -- to fill-up station and then carry on and continue, so ...

Q Right. Okay. I understand that. But I'm thinking once the truck has left. So the water has been sprayed on the road, it suppresses dust, and then what? Does any of that water -- does much of that water run off? Does it -- in interacting with the road dust to suppress it, does it essentially sort of evaporate later? Like, what happens to that water?

A Mr. O'Gorman, I -- I would say that that water essentially just -- it -- it would evaporate over time, and it -- I wouldn't -- I wouldn't think that it would run off. I think the -- the idea would be to put enough on so that it stayed on the road and not -- not to run off. So I guess if you put excessive watering, then -- then you -- you might get a small bit that would -- would leave the surface of the haul road.

Q Okay. So now I'm going to come to the big kicker of why I've asked you these questions. I'm guessing it might -- so remind us where that water is coming from.

A That -- that water is -- is likely coming from the -- the raw water pond.

Q Right. The raw water pond, which is the one receiving all of the high-selenium runoff from the rock dump

areas before it gets fed into the SBZ for treatment; correct?

A That's correct, yeah.

Q Okay. So I guess on first blush -- and I could -- I could get a calculator out and do some estimates of -- if you look at the concentration -- you've given us, and we discussed it back in the water section, the expected concentration -- I won't haul it up -- of selenium in the raw water pond. It was, as I recall, .7 milligrams per litre. Does that sound right? I think it was about -- you had an estimate in one table of, say, about .7 milligrams per litre. And you're looking at potentially spraying 16 million litres per year of that water over the roads. The water is going to potentially sit there and evaporate. And if water evaporates that's containing things like selenium, presumably the little molecules of selenium are just left there sitting on the roads after the water evaporates. Do you agree with that?

A MR. HOUSTON: I -- I -- I think that, you know, conceptually is right, Mr. O'Gorman. I'm not advanced enough in my chemistry to know if it would stay in the form of selenate or if there would be some kind of, you know, a reduction or oxidation process that would change it from -- from that form.

Q Okay. I mean, it seems that there's a potential for --

if there are molecules, potentially a whole lot of molecules of selenium left behind on the roads after watering, and then precipitation comes along, and some portion of that is washed into, for example, the pit where a lot of the dusty roads are that will be watered, and then some of it might make it out of the pit and make it into Gold or Blairmore Creek, or will all of that be captured somehow? Tell me what's going to happen -- the eventual fate of the selenium that you've sprayed onto your roads.

A All --

Q Because I'm going to suggest that it's not an insignificant amount of selenium.

A So -- so you raise -- raise an interesting point; however, all -- all of that -- you know, if -- if you consider the scenario where we have a -- say, a -- a storm and a -- a inundation washing some of that selenium off the road. It -- it would go into the groundwater system. It would not -- it would not run off the site. It would be captured on the site. And so it would end up either in the groundwater in the SBZ, if -- if it was in that area, or in the pit, and -- and it would manifest itself, I guess, in the water we extract from the pit.

Q Right. And the pit water, we recall, is supposed to be pumped to the sediment ponds; correct?

A It -- it will depend on -- on any selenium content in that water. So if -- if that pit water had high selenium content, we -- we would direct it towards a surge pond or to the --

Q Okay.

A -- raw water pond again.

Q Okay. And I'm guessing, if you could confirm, that the selenium that we're talking about now that was sprayed on roads and then either goes into the groundwater or washes off and ends up in the pit, water you're pumping out or, you know, some other -- in ditches around the site, I am guessing that you have not -- 'cause we incorporated that into your, you know, water quality modelling.

A No. And I -- okay. I'm -- I'm guessing here, but I -- I would think that it would be small compared to the other sources of -- of selenium. If it was not, I would suggest we'd have to change our watering -- road watering strategy and -- and use treated water or at least water that's coming out of the SBZ.

Q Okay.

A No, no. I -- good -- good questions and certainly something we need to check quickly to make sure that it's not an issue for the project.

Q Yeah, that might be worth doing. I was even thinking about the ditches you have around site capturing site

runoff water, not the -- is supposed to, as I recall, be directed to the sediment ponds, and that's supposed to be your non-selenium-laden water, but if you have this extra selenium being potentially washed into it, yeah, it's --

A Yeah.

Q But there's -- but there's been no estimates of the impact of this? That's, I guess, what I wanted to confirm, and --

A No.

Q -- you agree with that? Okay.

A I -- I agree with that. It -- it's something we'll take away, though, Mr. O'Gorman, and take a look at. The -- the water in the sedimentation ponds, even if this water had selenium in it and got that far, will be tested before it's discharged to the environment. So if there is an incidence of high selenium, that water would then get redirected back to the -- the raw water surge -- surge ponds or the raw water pond for -- for further treatment through the SBZ.

But I'll -- I'll -- I'll get our guys to run a check on this to see if it's a significant amount compared to the other selenium loading we're -- we're calculating.

Q Okay. That's all my questions. Thank you, gentlemen, and thanks for this panel. I think I -- I -- I -- I

think I wrap us up, so my -- the chair will speak, but I'd like to say thank you to all of you for the last few days of the questions that you've all put -- answered and -- to the best of your ability. We really appreciate it. So thank you.

A Thank you.

THE CHAIR: Okay. Thank you, Mr. O'Gorman.

So, yes, that is the end of the questions from the Panel. So another long slog.

Mr. Ignasiak, any re-direct?

MR. IGNASIAK: No, sir.

THE CHAIR: Okay. Well, with that, this panel's work is done, so thank you very much, Benga panel, for answering all of the questions of the participants and the secretariat and the Panel.

(WITNESSES STAND DOWN)

Discussion

THE CHAIR: So it is just about 4:30, and so it seems a bit late to start the Canada panel, particularly recognizing that many of the participants are probably in the Ontario, Quebec area, and it's later for them.

So, Mr. Drummond, if you are here, is it okay if we start your panel in the morning?

MR. DRUMMOND: I'm sure they're fine with

that, sir. Thank you.

THE CHAIR: Okay. And the other question I had was -- I'm just kind of doing the math to see if we can finish tomorrow, which depending on the answer to a few questions, it looks like we should be able to. So we have Canada available for cross-examination. I'm aware that between the secretariat and the Panel, we probably have about two hours of questions. I don't know how long Benga thinks it may be or if Mr. Ignasiak wants to provide an estimate.

MR. IGNASIAK: I think we would be fairly brief, Mr. Chair. I'd reserve 15 minutes, but I don't see anything beyond that.

THE CHAIR: Okay. Thank you.

And then in addition, we have direct from the Coalition, which is 45 minutes; and Livingstone Landowners Group, an hour and 30 minutes; and then, of course, any cross-examination resulting from them. And then the only other piece of business would be if Benga intends to do any reply evidence. That would be in addition to those things. So, subject to any comments from the participants, it looks like we should be able to finish tomorrow.

I did have a question about whether we wanted to start a bit earlier to ensure that we finish tomorrow. And by "earlier", maybe 8:30. I don't know that it's

necessary, but if we wanted some additional comfort, we could start a bit earlier. So I'll just put that to the participants and maybe hear particularly from Canada and Benga.

MR. DRUMMOND: Thank you, Mr. Chair. Robert Drummond here.

I think, just given -- because of the time difference for a few of the witnesses, I don't think an 8:30 time is -- is problematic at all and actually might be preferred, in part.

THE CHAIR: Okay. Yeah, I thought that might be the case.

Mr. Ignasiak, any concerns about starting earlier?

MR. IGNASIAK: No, none, sir.

THE CHAIR: Okay. Any other participants have concern with an 8:30 start?

Okay. Hearing none, we'll start at 8:30 tomorrow morning just to hopefully ensure we can finish tomorrow.

And is there any other business we need to take care of before we break?

Okay. Thank you, everyone. We'll see you again in the morning.

PROCEEDINGS ADJOURNED UNTIL 8:30 AM, DECEMBER 1, 2020

CERTIFICATE OF TRANSCRIPT:

I, Christy Longacre, certify that the foregoing pages are a complete and accurate transcript of the proceedings, taken down by me in shorthand and transcribed from my shorthand notes to the best of my skill and ability.

Dated at the City of Calgary, Province of Alberta, this 30th day of November 2020.

<Original signed by>

Christy Longacre, RPR, CSR(A)
Official Court Reporter

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