

JOINT REVIEW PANEL PUBLIC HEARING

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

GRASSY MOUNTAIN COAL PROJECT - BENGA MINING LIMITED

VOLUME 17

VIA REMOTE VIDEO

November 17, 2020

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1 Proceedings Taken via Remote Video

2

3 November 17, 2020 Morning Session

4

5 A. Bolton The Chair

6 D. O'Gorman Hearing Commissioner

7 H. Matthews Hearing Commissioner

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25 R. Warden For Ktunaxa Nation

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6	B. Snow	For Stoney Nakoda Nations
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8	R. Drummond	For Government of Canada
9	S. McHugh	
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11	A. Gulamhusein	For Municipality of Crowsnest
12		Pass
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14	M. Niven, QC	For MD of Ranchland No. 66
15	R. Barata	
16	J. Nijjer (Student-at-Law)	
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18	B. McGillivray	For Town of Pincher Creek
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20	D. Yewchuk	For Canadian Parks and
21		Wilderness Society, Southern
22		Alberta Chapter
23		
24	R. Secord	For Coalition of Alberta
25	I. Okoye	Wilderness Association, Grassy
26		Mountain Group, Berdina Farms

1		Ltd., Donkersgoed Feeder
2		Limited, Sun Cured Alfalfa
3		Cubes Inc., and Vern Emard
4		
5	R. Cooke	For Crowsnest Conservation
6		Society
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8	G. Fitch, QC	For Livingstone Landowners
9	C. Agudelo	Group
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12		Society and Mike Judd
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23	J. Gourlay-Vallance	For Eco-Elders for Climate
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3 (No Counsel) For Alistair Des Moulins
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5 (No Counsel) For David McIntyre
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12 (Not Present)
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14 (No Counsel) For Monica Field
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16 S. Frank For Oldman Watershed Council
17 A. Hurly
18
19 C. Longacre CSR(A) Official Court Reporter
20 _____
21 (PROCEEDINGS COMMENCED AT 9:04 AM)
22 THE CHAIR: Okay. Good morning, everyone.
23 Just a reminder that live audio and video -- oh,
24 just making sure I'm not muted. Yeah.
25 Just a reminder that live audio and video streams
26 and video recordings of this proceeding are available

1 to the public through the AER's website and YouTube.
2 Anyone in the virtual hearing room with their camera or
3 microphone turned on will be captured, and images and
4 recordings of you and your surroundings will be
5 broadcast to a publicly available YouTube video.

6 If you have concerns about this, please contact
7 counsel well in advance of the time you're scheduled to
8 participate to explain your concerns. We will try to
9 accommodate your concerns considering the need for an
10 open and transparent public process.

11 Is there any -- are there any preliminary matters
12 before we return to cross-examination?

13 Hearing none, Mr. Secord, you can continue your
14 cross-examination of the Benga panel.

15 MR. SECORD: Good morning. Thank you, sir.

16 GARY HOUSTON, DANE MCCOY, MIKE YOUL, MIKE BARTLETT,
17 CORY BETTLES, DAVID DEFOREST, SOREN JENSEN,

18 MARTIN DAVIES, LEIF BURGE, DAN BEWLEY, Previously
19 Affirmed

20 STEPHEN DAY, NANCY GRAINGER, Previously Sworn

21 (Water, including surface and groundwater management,
22 quantity and quality, selenium management and aquatic
23 resources, including fish and fish habitat and fish
24 species at risk)

25 Mr. Secord Cross-examines Benga Mining Limited

26 Q MR. SECORD: Ms. Grainger, I'd like to just

1 circle back on some of our discussion yesterday. And
2 just to refresh your memory, I had drawn your attention
3 to the "Model Assumptions", Bullet Point 5, which
4 says -- and -- and I don't think we need to turn this
5 up, but it says: (as read)

6 Apart from preferential flow parallel to
7 fault strike, there is no major fault acting
8 as a significant conduit and no major
9 regional deep-flow influence.

10 I then referred you to Bullet Point 2 on PDF page 209,
11 the CR Number 3 in CIAR 42, which states in part:
12 (as read)

13 The north-south thrust fault systems are
14 modelled to impede flows in the east-west
15 direction.

16 I then asked you yesterday: Do you agree that this
17 configuration will have a profound effect on how much
18 drawdown will propagate outward to the west and east of
19 the mine pit? We have your answer on the record from
20 yesterday.

21 I then asked you, Please explain why the model has
22 been configured this way when we know there is evidence
23 of active west-east faults based on the trellis-style
24 drainage pattern. And we have your answer on the
25 record from yesterday.

26 And then I asked you, Do you agree that the

1 trellis-style drainage pattern is a fault drainage
2 system and that this is typical in the mountains? And
3 we have your answer from yesterday.

4 MR. SECORD: So I would now like to have
5 the Zoom host turn up CR Number 3 in CIAR 42 at
6 PDF page 193.

7 And, again, this is in the -- if you could scroll
8 down to the bottom of the -- of the Section 2.2.2.4,
9 "Fernie Group".

10 Q MR. SECORD: And this is dealing with the
11 SRK model. It states there: (as read)

12 No testing data were obtained for the sales
13 of the Fernie group, which underlie the
14 Kootenay group rocks.

15 I take it that statement is correct, Ms. Grainger?

16 A MS. GRAINGER: Yes, that's correct.

17 Q And under Section 2.2.2.5, under "Thrust Faults", it
18 says: (as read)

19 While no testing data exists for the thrust
20 faults in the area of the project, it is
21 likely that these faults which strike
22 parallel to the Hog's Back Ridge likely
23 present a flow -- a hydraulic barrier to flow
24 perpendicular to them given the cataclastic
25 nature of these faults and the tendency to
26 form low permeability fault gouge.

1 Now, I would like to have the Zoom host pull up Aid to
2 Cross AQ Number 5, "Coalition", and it's described as
3 "coulee veins AAPG". And this is a paper entitled,
4 "Stable-Isotope Geochemistry of Syntectonic Veins in
5 Paleozoic Carbonate Rocks in the Livingstone Range
6 Anticlinorium and Their Significance to the Thermal and
7 Fluid Evolution of the Southern Canadian Foreland
8 Thrust and Fold Belt", by Michael A. Cooley, Raymond A.
9 Price, T. Kurtis Kyser, and John M. Dixon, published in
10 AAPG Bulletin, Volume 95, Number 11, November 2011,
11 pages 1851 to 1882.

12 Do you agree, Ms. Grainger, that the Morin Creek
13 tear fault is shown on Figure 2 on PDF page 4?

14 A Yes, I see that there.

15 Q And do you see that it is also shown on Figure 3 on
16 PDF page 6?

17 A Yes, I see that on page 6 as well.

18 Q And do you agree that the Morin Creek tear fault is
19 immediately east of Gold Creek and has significant
20 displacement along it?

21 A It's located on the range to the east of the project.
22 I didn't review the information regarding the
23 displacement, but that's not substantial, I don't
24 think.

25 Q Do you agree -- if we turn to PDF page 1, do you agree
26 that in Figure 10 on PDF page 12 the Mike Cooley paper

1 shows many of these east-west transverse faults?

2 A It appears to.

3 Q Right. And we see, in fact, Caudron Creek, which
4 actually runs through Ms. Gilmar's property; correct?

5 A I'll take your word for that.

6 Q Okay. Have you been to the mine site, Ms. Grainger?

7 A I personally have not, but my team has.

8 Q Okay. Do you agree that these faults don't have a
9 large displacement along them, but they are fractures
10 which allow fluids to move along them?

11 A I'm afraid, Mr. Secord, I've had limited time to review
12 the paper, so I'm not familiar with how much
13 displacement has occurred upon -- on these features.

14 Q Do you agree that these features can be seen in all
15 outcrops of competent sandstone layers on Grassy
16 Mountain?

17 A I would disagree with that. I think it might be
18 helpful if we can go to CIAR 42, Consultant Report
19 Number 3, page 85. So there's several cross-sections
20 that are shown here, and the East-West 3, in
21 particular, is quite helpful. It shows the purple
22 outline of the bottom of the pit, and you can see
23 Blairmore Creek and Gold Creek are illustrated there,
24 and the rocks that are described in this paper,
25 Mr. Secord, are shown in the brown and sort of hatched
26 pattern, so occur on the range to the east. So it's

1 clear from this cross-section that they are at
2 significant depth underneath the project site.

3 Q Okay. I asked you if you agree that these fractures
4 can be seen in all outcrops of competent sandstone
5 layers on Grassy Mountain. You said you disagree, but,
6 in fact, you have never been to Grassy Mountain and
7 have not looked at these outcrops; is that correct?

8 A I'm saying that there's no evidence for these east-west
9 features on Grassy Mountain, and that's because the
10 geology is fundamentally different between Grassy
11 Mountain and the Livingstone Range to the east.

12 Q Okay. But my question was that: Do you agree that
13 these fractures can be seen in all outcrops of
14 competent sandstone layers on Grassy Mountain? That
15 was the question. And you say you disagree, but, in
16 fact, you have never been to Grassy Mountain and looked
17 at these outcrops. Do I have that correct?

18 A MR. HOUSTON: Mr. Chair, I -- what I heard
19 Ms. Grainger say is that her team has been on Grassy
20 Mountain and has done extensive work there. What I've
21 heard her say is that -- and she pointed out in this
22 cross-section that the formations that Mr. Secord is
23 talking about are well below the bottom of the mine.
24 So that -- that's the evidence that I heard
25 Ms. Grainger provide.

26 Q Okay. If we could turn to PDF page 12 of CIAR

1 Number 5. So, Ms. Grainger, do you have --

2 MR. SECORD: Do we have that up, Zoom Host?

3 A CIR -- it's not Registered Document 5. It's Aid to
4 Cross 5; right?

5 Q MR. SECORD: AQ Number 5.

6 A Yeah.

7 Q And if we go to PDF page 11 and scroll down. So at the
8 bottom of the first column, it states: (as read)

9 Regularly spaced, approximately 150 metre,
10 approximately 492 feet, east-west striking
11 deeply dipping zones of intense fracturing
12 and minor faulting transect. The north-south
13 striking limbs and hinge zones of
14 chevron-style folds in the vicinity of
15 Green Creek, Warren Creek, and Caudron Creek,
16 Figure 10. The fracture zones which commonly
17 contain one or more discrete but
18 discontinuous fault services are commonly
19 marked by gullies that form conspicuous
20 erosion features in the steeper slopes and
21 cliffs, Figure 10A and B.

22 Ms. Grainger, do you agree that the trellis-style
23 drainage is a direct indicator of this type of fault
24 influence?

25 A MS. GRAINGER: I do not.

26 Q If the faults are in the deep formation, then why are

1 they visible at surface?

2 A Well, as I understand it, Mr. Secord, they are visible
3 at surface on the Livingstone Range, but they don't
4 occur on the Grassy Mountain.

5 Q So you're saying that they are not visible at the
6 surface on Grassy Mountain?

7 A Yes. If we go to page 23 of the PDF, at the bottom of
8 that page, there's a note -- or a sentence there that
9 reads: (as read)

10 The Morin Creek tear fault, Figure 3; the
11 Daisy Creek tear fault, Figure 5; and the
12 smaller transverse faults in the limbs of the
13 anticlines, Figure 10A, all terminate upward
14 within the lower part of Mount Head
15 Formation, which indicates these fractures
16 were formed in the late Mississippian during
17 deposition of the Mount Head Formation.

18 And then speaks of reactivation of those faults, but
19 also in the same time frame, these rocks are
20 substantially older than the rocks on Grassy Mountain.

21 Q So what you're saying -- so what I understand you to be
22 saying, Ms. Grainger, is that we have evidence of
23 east-west faults in the Daisy Creek area directly north
24 of the project, we have evidence of east-west faults
25 adjacent to the project essentially to the east of the
26 project area, but magically, the model has been

1 constructed in such a way to eliminate the presence of
2 any east-west faults in the project area?

3 A MR. HOUSTON: Mr. Secord, I think what --

4 Q Mr. Houston, my question is for Ms. Grainger --

5 A Was --

6 Q -- and under the rules of practice, I am entitled to
7 ask a particular witness a question. Rule 23 of the
8 AER Rules of Practice. Now, if she is incapable of
9 answering the question, then the Chair can have another
10 of your witness panel answer it. But she's supposed to
11 be a geologist; she should be the one answering these
12 questions.

13 A Well, Mr. Secord, I think --

14 MR. SECORD: I'd like a -- I'd like a
15 ruling, Mr. Chair.

16 A I -- Mr. Secord, I'd like to be able to --

17 MR. IGNASIAK: Mr. Chair --

18 MR. SECORD: I'd like a ruling.

19 MR. IGNASIAK: Mr. Chair, I think the panel
20 is allowed to determine how the question's answered.
21 Certainly there's nothing inappropriate with
22 Mr. Houston providing an overview, and to the extent
23 Ms. Grainger needs to expand on it, she can.

24 THE CHAIR: I would suggest that
25 Mr. Secord is entitled to ask Ms. Grainger the
26 question, and if she's unable to respond or Mr. Houston

1 wants to supplement the response, I think that is fine.

2 A MR. HOUSTON: Mr. Chair -- Mr. Chair, what I
3 was going to say and what I was going to object to is
4 the characterization of us magically creating a model
5 that ignores information. I -- I didn't think that was
6 an appropriate comment, and -- and perhaps Mr. Secord
7 could rephrase his question, and then Ms. Grainger can
8 answer it.

9 THE CHAIR: Okay. Go ahead, Mr. Secord.

10 Q MR. SECORD: So, Ms. Grainger, if I
11 understand your evidence, there are -- there is
12 evidence of east-west faults in Daisy Creek immediately
13 north of the project area; correct?

14 A MS. GRAINGER: I am sorry. I hadn't reviewed
15 where the Daisy Creek tear fault is located.

16 Q Do you know where Daisy Creek is in the project area?

17 A Yes, I certainly know where Daisy Creek is located.

18 Q And you agree that there's east-west faults adjacent to
19 the project area in Caudron Creek, the Morin tear
20 fault?

21 A There, clearly from this paper, are east-west tear
22 faults that are located on the Livingstone Range to the
23 east of the project site.

24 Q Okay. And to be clear, the model has been constructed
25 in such a way that there are no east-west faults in the
26 actual project area. Do I have that correct?

1 A Correct. The -- the model does not include east-west
2 faults because there's no evidence of them on Grassy
3 Mountain. The fact that they are, you know -- that
4 they do occur on the Livingstone Range to the east in
5 different rocks than occur on Grassy Mountain, that was
6 taken into account when we constructed the model. So
7 there's no evidence for these features also occurring
8 on Grassy Mountain.

9 Q And if I look at your CV -- which I don't know if we
10 need to turn it up, but it's at CIAR page 571, PDF
11 page 205 -- am I correct that you have degrees in
12 earth -- in the University of Waterloo earth science
13 program?

14 A Yes. I have a bachelor of science from the University
15 of Waterloo in earth sciences, which was a
16 specialization in hydrogeology.

17 Q Right. And you are a registered as a professional
18 geologist?

19 A That's correct.

20 Q And if we then go back to -- if we could go back, then,
21 to some questions I asked yesterday where we had --
22 didn't make much progress, and maybe I can just refresh
23 your memory on those. This is dealing with adding --
24 basically the proposition is that SRK added too much
25 recharge to the model domain. So I referred you to --
26 and, basically, how will this affect the extent of the

1 drawdown in those portions of the model domain.

2 And I referred you to -- I referred you to PDF
3 page 183 of CR Number 3. I don't think we need to
4 turn it up. But I drew your attention to -- the MAP
5 for the entire Blairmore catchment is estimated at
6 719 millimetres and Gold Creek, 777 millimetres.

7 I then indicated that SRK used the average number
8 of 28 percent for recharge in its model. You seemed to
9 have some difficulty with that even though it is
10 clearly stated in the application that 28 -- the
11 28 percent number was used for recharge. So,
12 basically, we -- I said, The model will -- the model,
13 then, is saying that 28 percent of the Gold Creek
14 MAPA -- MAP will end up as recharge, and then do you
15 agree that in some areas of the model, the recharge is
16 as high as 50 percent? And then we have your answers.

17 And then I said, Do you agree that the model
18 underestimates how bad the recharge can get in some
19 parts of the mine site? And that's where we kind of
20 left off yesterday.

21 So I assume you've had a chance to look at the
22 modelling that SRK did, and so I'd like to continue
23 with that line of questioning. Do you agree,
24 Ms. Grainger, that by adding more recharge to certain
25 parts of the model domain, it will effectively reduce
26 the spatial extent in magnitude of drawdown simulated

1 for those areas?

2 You're on mute.

3 A Sorry.

4 I was going to ask your permission, Mr. Secord, to
5 provide you the information that you'd requested
6 yesterday.

7 Q Sure.

8 A So I wanted to provide one clarification first. On
9 CIAR 42, Consultant Report Number 3, PDF page 179, we
10 reference -- and we don't need to bring this up. I'll
11 just reference it. But we do reference that the mean
12 annual precipitation at the property was determined to
13 range from 611 to 992 millimetres. The model then
14 used -- actually tested a series of equations to relate
15 precipitation relative to elevation because that
16 description also talks about how there is a positive
17 correlation between precipitation and elevation. So
18 the precipitation increases with elevation.

19 And the information you were requesting yesterday
20 is on PDF page 215 of that same document.

21 Q Let's pull that up, then.

22 A Yes. So on the left-hand side, it shows --

23 Q Maybe just wait till it's up.

24 A Sure.

25 So on the left-hand side, it shows some of the
26 areas which were increased. So, for example, there was

1 a clearcut area -- we talked about that yesterday --
2 where precipitation was increased by a factor of 2 to
3 represent the lower evapotranspiration.

4 On the right-hand side are two maps that show the
5 distribution of recharge that was applied to the model.
6 And as I said, there was a series of -- of
7 relationships that were tested between recharge and
8 elevation, two that were selected as best producing or
9 matching the base flows that are observed at the site,
10 and these are the linear and the exponential functions.
11 So the map on the top shows the distribution of linear
12 recharge or the -- the distribution of recharge from
13 the linear equation that was applied to the model, and
14 then on the bottom is the exponential equation, the
15 recharge distribution that was applied as a result of
16 that so that it's -- as I was trying to explain
17 yesterday, it's not a simplistic 28 percent. The
18 28 percent represent, essentially, the average across
19 the site of the recharge -- excuse me -- that was
20 applied, but you can see that it's lower in some areas
21 and higher in some areas.

22 Q Right. Okay. So I think we will come back to that
23 figure in a moment or two.

24 Do you agree, Ms. Grainger, that these high
25 recharge values will certainly work to reduce the
26 magnitude of base-flow reductions reported in

1 Gold Creek?

2 A I think it's important to understand that the model
3 actually is calibrated to the base flow. So the
4 observed base flow that was inputted into the model --
5 the recharge was actually calibrated or modified in
6 order to reproduce the base flow that was observed, and
7 those were some of the -- we looked at the groundwater
8 plots yesterday that show the measured and model
9 output, but that's how those are generated.

10 So the intent is: There's a series of assumptions
11 that are built into the model as we best can represent
12 the physical characteristics of the site, and then
13 through a process of calibration, we modify those
14 assumptions in order to match the observations at the
15 site. So that would be specifically with respect to
16 the base flow and then the hydraulic head that is
17 observed at multiple locations throughout the site.

18 Q So I would like to get your answer, though, under oath
19 to this question: Do you agree that these high
20 recharge values will certainly work to reduce the
21 magnitude of base-flow reductions reported in Gold
22 Creek as a result of this mining project being
23 approved? So, in other words --

24 A I guess --

25 Q -- if it -- if it goes ahead based on this model and
26 these results, do you agree that these high recharge

1 values will work to reduce the magnitude of base-flow
2 reductions reported in Gold Creek?

3 A I do not agree, and the reason is because the recharge
4 that was utilized matches, within a statistical
5 accepted range, the observed base flow on the site.
6 And so I don't believe that the recharge that was used
7 is over -- is too high.

8 Q Okay. Let's turn up PDF page 228 of CR Number 3 in
9 CIAR 42, Figure 5-14, "Monthly Base-Flow Variability".
10 And you'll see in the legend on the left-hand side of
11 Figure 314 the blue line is the observed Blairmore
12 Creek base flow, and the dotted line is the calculated
13 Blairmore Creek base flow, and then we have a
14 similar legend for Gold Creek.

15 How do you explain, Ms. Grainger, the considerable
16 difference between the models calculated versus
17 observed base-flow variability?

18 A Well, there are differences. I think the intent is
19 that, on the whole, we've got a reasonable match. I
20 agree that some don't show as good a match, and we have
21 discussed in the model report that there are specific
22 areas where the model doesn't fit as well, but on the
23 whole, we believe it is representative.

24 Q Do you agree that the model appears to consistently
25 overpredict monthly base flow in Blairmore Creek? So
26 if we look at, for instance, BC -- sorry, BL03, BC07,

1 BL02, BC03, BL01, in every instance, we have the
2 calculated -- model calculated Blairmore Creek base
3 flow above the observed Blairmore Creek flow for most
4 of the period 2013 to 2016; correct?

5 A I think what's observed here on these plots is that,
6 likely on a mean annual basis, the base flow is
7 similar. What we're not seeing is the model
8 representing the -- the peaks of recharge -- of
9 base-flow recharge.

10 Q In fact, would you agree that the scale of the graph at
11 GC13 hides the base-flow variability so you can't even
12 see what it is?

13 A I think the intent was to include a consistent scale on
14 all of the figures, not hide the information,
15 Mr. Secord.

16 MR. SECORD: Please turn up CIAR 42,
17 Section E, PDF page 103, Figure 5.1-1, "Overview of the
18 Mine Plan, Selenium Management Plan, and Surface Water
19 Management Plan". And this should be Figure 103. Do
20 we have -- is this Section E?

21 MS. ARRUDA: Mr. Secord, do you have a page
22 number?

23 MR. SECORD: Yeah. I had this as
24 Figure 5.1.1 [sic] in Section E. Let me just take a
25 look here.

26 Sorry. I must have typed in -- it was actually

1 CR Number 3. My apologies.

2 Thank you very much.

3 Q MR. SECORD: So, Ms. Grainger, in this
4 legend, it shows the -- basically the end-pit lake; the
5 northeast sediment pond, or NESP; the east sediment
6 pond, ESP; and the southeast surge pond, the SESP; as
7 well as the saturated fill zones. In the legend,
8 they're shown as -- shown in blue; correct?

9 A MS. GRAINGER: Yes, that's correct.

10 Q Okay. And I was just curious, Mr. Houston. Yesterday,
11 I believe you -- when you were answering Mr. Yewchuk's
12 questions, you indicated to him that the entire mine
13 site was going to end up as a selenium SBZ landfill.
14 Do you recall saying that?

15 A MR. HOUSTON: Yes, I do.

16 Q And so do I understand, then, that -- that -- is
17 this -- is this actually changed, then? These areas
18 that are shaded blue, the saturated fill zones, are
19 they -- have they been superseded?

20 A No, Mr. Secord. Essentially the -- the -- the SBZ
21 zones that you see there are the main volumes where --
22 where water would accumulate, but the water physically
23 decants from the two zones in the north through --
24 through the rock fill to the -- the zone in the south.

25 Q But should the entire area shaded or covered by the
26 black project area line -- should that really -- should

1 the entire area be shaded in blue, then, to be -- to
2 be -- to depict this saturated fill zone?

3 A Yeah. No. I -- I understand your question. The --
4 but in order to calculate the volumes and the -- and
5 the residence time in -- in the SBZ, we've -- we've
6 focused on those three areas. But the water does
7 physically flow through the rock from the two larger
8 pools in the north to the one in the south.

9 Q I noticed yesterday you were mentioning -- Mr. Houston,
10 you were talking about Gold Creek and how some areas of
11 it have dried up in the past. You recall that
12 discussion?

13 A It's not in the past, Mr. Secord. That's -- that's
14 happening in the current time.

15 Q Sure. But I take it you -- you pulled up a photograph
16 of an area of Gold Creek that had dried out. You
17 recall?

18 A Yes, a couple of them, actually.

19 Q At what time of year were those photographs taken?

20 A I believe one was taken in August, and the other may
21 have been taken earlier in the year.

22 Q Okay. So August of -- do you recall what year?

23 A 2019, I believe.

24 Q Okay.

25 A Just a minute, Mr. Secord. We just want to --

26 Q No.

1 A Oh, sorry?

2 Q No. That's fine.

3 A Okay.

4 Q I -- if you miss -- if you think it's important and you
5 want to change your answers, I'm not sure that it's
6 critical, but -- but come back to me if you -- if
7 you've got different information. I --

8 A Okay. Just -- just -- just I've got somebody waving at
9 me, so I might have misspoke. I just want to confirm
10 what that was.

11 So, Mr. Secord, the photos were taken in September
12 of 2016. I was mistaken.

13 Q Yeah. Not a problem.

14 So you mentioned that -- that Benga is going to be
15 in a position where it can remedy these low flows that
16 occurred in, for instance, these low-flow months of,
17 like, August and September. So looking at -- looking
18 at the project map here that we have in front of us,
19 how is -- where is the water going to come from that
20 you're going to put into Gold Creek to augment the flow
21 so that we no longer see those dry areas that you
22 pointed out?

23 A Yeah. So that's a really good question, Mr. Secord.
24 Thank you. And -- and I'm -- I'm happy to have the
25 opportunity to explain a bit more clearly.

26 What's happened at those sections of the creek is

1 that the creek has physically jumped out of its
2 historical channel, and that was probably caused during
3 the -- the flooding that occurred; I believe it's
4 around 2013. And what happens in those areas is that
5 water actually spreads out and flows through the treed
6 area, but through many, many channels. So it's flowing
7 cross-country, if you will, not in a defined channel.
8 And because of that and because there is a gravel kind
9 of surface in those areas, the water actually is still
10 there, but it's below the surface in those areas. So
11 it's not a matter of creating more water; it's a matter
12 of diverting the water back to the main channel, having
13 it concentrated in that channel, and -- and that will
14 ensure that there's water above the surface even during
15 the dry seasons.

16 Q Okay. So if I understand it correctly, then, Benga has
17 no intention of augmenting the flow of Gold Creek by
18 pumping water into the creek at some point, such as
19 GC10, for instance, or GC13? You're not going to run
20 a -- you're not going to run a hose from the end-pit
21 lake and start pumping water into Gold Creek or taking
22 water from Blairmore Creek, for instance, and shifting
23 it over?

24 A No. We -- we did a -- we did an instream flow needs
25 assessment in -- in 2016, and that was fully reported
26 in -- I believe it's addendum -- it's -- it's Registry

1 Document 44, in any case. And we did an instream flow
2 needs assessment and determined that the amount of
3 water in Gold Creek is sufficient. What -- what's
4 going on at these sites is -- is not about the amount
5 of water; it's about the fact that the channel has been
6 damaged by -- by flooding and -- and the water is going
7 subsurface --

8 Q Okay.

9 A -- in specific areas.

10 Q So just to be clear, you're -- Benga's proposal, then,
11 to save the westslope cutthroat trout is -- has nothing
12 to do with augmenting the flow of water in Gold Creek
13 but to do some channelling work in some of those areas
14 where you took those photographs and try and improve
15 the channel? That's really what you're talking about?

16 A That -- that is what is contained within our fisheries
17 offsetting plan, yes.

18 Q Okay. If we could turn up CR Number 3, PDF page 242.
19 This figure is entitled "Figure 3-22, Predicted
20 Drawdown EOM", end of mine; correct?

21 A MS. GRAINGER: Correct.

22 Q And if we could just discuss the legend. If we could
23 just discuss the legend for a minute. You have
24 "drawdown in metre iso lines" and then "drawdown in
25 metres fringes". What does that depict, Ms. Grainger?

26 A Well, the colouring just indicates the range of

1 drawdowns shown within that area. So the very light
2 blue shows the area where drawdown is predicted to be
3 between 5 and 30 metres, as an example.

4 Q So what -- what are -- what are the iso lines?

5 A I think it just refer -- well, the iso line, I'm
6 assuming that refers to the outermost line which is
7 where drawdown is predicted to be 5 metres.

8 Q And the fringes?

9 A Well, I think the fringes is the coloured portion which
10 just indicates that in that coloured area, it varies,
11 but it's obviously going from the 5-metre iso line on
12 the light-blue pattern towards the 30-metre drawdown
13 outline.

14 Q So this Figure 3-22 shows the mine area as a sink;
15 correct?

16 A Correct. It's representing the drawdown that's
17 occurring as a result of the mining.

18 Q And the drawdown is, what, 300 to -- 300 to 430 metres?

19 A Yes. The maximum drawdown is 430 metres at the very
20 deepest part of the pit.

21 Q And then you recall we looked at that previous figure,
22 and I note that we have these areas that are --
23 basically step out towards the bottom. You'll notice
24 how in the area of the northeast -- or the northeast
25 sedimentation pond, or the NESP, it looks like there is
26 a drawdown area of 5 to 30 metres. Do I have that

1 right?

2 A Sorry. I'm just quickly comparing the two maps. I
3 mean, I -- I think that's correct, but I'd have to --
4 it doesn't -- because the two maps don't overlay the
5 features, it's --

6 Q Is there --

7 A -- harder to compare the areas.

8 Q Is there any doubt in your mind that the area where we
9 see this 5- to 30-metre drawdown is in the area of the
10 northeast sedimentation pond, Ms. Grainger? Do you
11 want to go back to the previous document and take a
12 look at it?

13 A MR. HOUSTON: Mr. Chair, we'll just take --

14 A MS. GRAINGER: No.

15 A MR. HOUSTON: Sorry. We'll just take a
16 minute to -- to consult here, if you don't mind.

17 MR. SECORD: Maybe, Zoom Host, we can
18 just put back for -- flip back for a moment to the
19 Figure 5.1.1.

20 A MS. GRAINGER: Mr. Secord, yes, I've
21 confirmed that that area in the northeast does coincide
22 with the northeast sediment pond location. Apologies
23 for my delay.

24 Q MR. SECORD: Right. And then I'm assuming
25 you can confirm that the ESP -- let's go back to
26 Figure 3.1.1 -- sorry, 3-22 on PDF 242. Yeah.

1 I take it you can confirm, Ms. Grainger, that --

2 A Yes, that --

3 Q -- that that -- that that second area where it steps

4 out in Section 30 is the east sedimentation pond?

5 A That's correct.

6 Q All right. And that's the -- that's the area that is

7 directly in the -- in the northwest quarter of 30,

8 which is directly to the north of Fran Gilmar's

9 property in the southwest of 30? You're familiar with

10 where my client Ms. Gilmar lives?

11 A I'm afraid I'm not, so I will take your word for that.

12 A MR. HOUSTON: I -- I can confirm that for

13 you, Mr. Secord. I agree with that.

14 Q All right. And then I'm less certain about this,

15 Mr. Houston, but the area of the southeast surge pond,

16 is that -- would that be in the area sort of towards

17 the south -- I guess this would be south and west -- or

18 I guess the north is going -- yeah. So it would be

19 essentially --

20 A South.

21 Q -- south of --

22 A Southeast.

23 Q Yeah. South --

24 A Southeast surge pond, yeah.

25 Q Yeah. Yeah. Is that sort of in the vicinity of that

26 other drawdown area that we see on the --

1 A Yeah.

2 Q -- bottom left-hand side?

3 A Yeah. Mr. Secord, this -- this model is obviously
4 assuming that those ponds are all empty, and so that
5 would be roughly the depth of pond that we're looking
6 at on this model.

7 Q Okay. Can you tell me: What is the model actually
8 showing in the -- near the northeast sedimentation pond
9 and the east sedimentation pond?

10 A As I just mentioned, Mr. Secord, the model's showing --
11 yeah. So you want Nancy to -- Ms. Grainger to answer
12 this question?

13 Q Well, maybe you -- maybe you have some expertise in
14 modelling. Are these edge effects?

15 A These -- these are ponds that are empty, and -- and in
16 the immediate vicinity of the pond, it's going to
17 create a drawdown on the groundwater table.

18 Q Okay. And, Ms. Grainger, do you know what "edge
19 effects" are in modelling?

20 A MS. GRAINGER: Sorry. I was on mute.

21 Sorry. That is not a term I'm familiar with, with
22 respect to modelling.

23 Q Mr. Jensen, are you familiar with the term "edge
24 effects" in modelling -- in SRK's modelling?

25 A MR. JENSEN: I did not -- I'm not a
26 hydrogeologist, and I did not model this sort of thing,

1 so in the context of hydrogeological models, no, I am
2 not.

3 Q So, Ms. Grainger, do you know if SRK have numerical
4 instability in their model which may be producing these
5 edge effects on --

6 A MS. GRAINGER: No.

7 Q -- on -- in Figure 3-22?

8 A My understanding, Mr. Secord, is that these are not
9 edge effects; they are a result of the inputs that were
10 entered into the -- the model with regards to the mine
11 activities.

12 Q Okay. So do I understand, then, that as a result of
13 this SRK figure, 3-22, there is going to be drawdown of
14 up to 5 to 30 metres, very close to the Gold Creek, and
15 that it is going to pull water from Gold Creek?

16 A This is identifying that there's drawdown in those
17 areas. It doesn't necessarily -- and, in fact, I can
18 find the references, but there was an exchange of IR
19 responses that looked specifically -- I know there's no
20 drawback from the creeks towards the mine.

21 Q You know that Gold Creek flows essentially through
22 Fran Gilmar's property and then through the northeast
23 quarter of 30 and is essentially almost adjacent to the
24 east sedimentation pond? I take it you're familiar
25 with how the creek flows through the --

26 A I --

1 Q -- through Section 30?

2 A Well, I can see it on the map, and I'm -- I've now been
3 made aware that that's where Fran Gilmar's property is.

4 Q Right. And the creek itself would be -- would be less
5 than 100 metres from -- would be approximately, what,
6 100 metres from the east sedimentation pond?

7 A It is quite close.

8 Q And the creek is also within 100 metres of the
9 southeast surge pond?

10 A MR. HOUSTON: I -- I can confirm that,
11 Mr. Secord.

12 Q And the creek would also be within a hundred metres or
13 so of the northeast surge pond? This is Gold Creek.

14 A Yes. I can confirm that as well.

15 Q Okay. Why are you getting drawdown under a pond which
16 will likely be recharging the groundwater?

17 A Mr. Secord, am I allowed to answer this question?
18 Because my response would be: The pond is sometimes
19 empty.

20 Q So what's happening, then, the empty pond is drawing
21 down --

22 A As --

23 Q -- groundwater?

24 A As Ms. Grainger pointed out, we have input operating
25 parameters from the project into the groundwater model,
26 and -- and at times, those ponds will be empty, and so

1 that -- that would affect the -- the groundwater in the
2 immediate vicinity of the ponds.

3 Q Yeah. Near the -- near Gold Creek?

4 A We've -- we've established that those ponds are near
5 Gold Creek, yes.

6 Q Right. Okay.

7 If we could turn up CR Number 3, PDF page 246, in
8 Exhibit 42. And this figure is entitled "Predicted
9 Drawdown LTC" or "long-term closure"; correct?

10 A MS. GRAINGER: Sorry. I was on mute.

11 Correct.

12 Q So what is the -- what is the time frame for --
13 represented by Figure 3-22, "Predicted Drawdown End of
14 Mine"? What period is that covering?

15 A Well, "end of mine" is a snapshot immediately at the
16 end of maximum mining. I can get you the exact year.

17 Q Okay. And then Figure 3-25 that we have up now, this
18 would be what -- this is at the end of the --

19 A This --

20 Q Sorry. Go ahead.

21 A Yes. This represents the -- essentially the new
22 equilibrium, so it's long-term closure; it was a
23 steady-state model run. So it -- it represents the new
24 equilibrium at the project site.

25 Q So if we study Figure 3-22 and Figure 3-25, the model
26 projects that the drawdown will be limited to

1 400 metres out for the mine pit area in all directions;
2 correct?

3 A Correct. Yes. I mean, this figure doesn't show the
4 edge of the -- the mine, so -- but it's -- it's
5 quite -- it's close, certainly, to the pit.

6 Q So if you, one, limit the conductivity in an east-west
7 direction -- which, Ms. Grainger, you said you have
8 done in the model -- and, two, if you put more recharge
9 into the 1,500-hectare mine area that is realistic, do
10 you agree that you will get less drawdown of base flow
11 in Blairmore Creek and Gold Creek?

12 A I guess I -- sorry. I'll just restate. I guess if one
13 was to apply too much recharge and reduce the
14 conductivity, then obviously it would impact the
15 distribution of the drawdown.

16 Q Do you agree that this scenario had something to do
17 with how hydraulic conductivity values were selected
18 for the SRK model layers; i.e., the lower k-value in
19 the west-east direction as opposed to the north-south,
20 leading to more drawdown in a north-south direction?

21 A I disagree with that statement. The sensitivity
22 analysis specifically looked at that condition, so the
23 conductivities in the north-south direction were about
24 half an order of magnitude higher than in the east-west
25 direction. And that was tested in the sensitivity
26 analysis. So I'll just see if I can find a page number

1 for you.

2 Q We are going to --

3 A So --

4 Q We are going to look at some of those tables.

5 A Right. So PDF page 256, if I can. So under the "'K'
6 Anisotropy", the last case, so anisotropic basically
7 removes that influence of the thrust faults which
8 reduce the 'K' in XY -- or in the east-west direction,
9 and you can see that that had no measurable effect
10 or --

11 Q Right.

12 A -- on -- on the heads or on the base-flow predictions.

13 Q So do you agree that it is better for the Benga project
14 to have drawdown in a north-south direction rather than
15 an east-west direction?

16 A What I'm saying is that the way the model was
17 constructed with that assumption doesn't actually
18 significantly affect the outcome. Had we not included
19 a reduced conductivity in the east-west direction, we
20 would've had a similar outcome of the model.

21 MR. SECORD: If we could turn up CIAR 793,
22 PDF page 150, and this is Transcript Volume 8 at
23 page 1896.

24 Q MR. SECORD: And just while we're waiting
25 for that, Ms. Grainger, in relation to your last
26 answer, I would put it to you that the reason for the

1 model not showing greater impacts by removing the
2 east-west direction or faults is because SRK has been
3 putting and is putting too much recharge into the
4 project area. Would you agree with that proposition?

5 A MR. HOUSTON: I don't think we agree with
6 that proposition, Mr. Secord.

7 Q Yeah. But --

8 A And -- and we've -- we've been discussing this for
9 quite some time, and we haven't created a model based
10 on what we want to occur. We're -- we're creating a
11 model based on the physical conditions at site. We've
12 calibrated it to site. The -- you know, the mean
13 annual precipitation and the care that we've taken in
14 distributing that across the -- the site -- this is not
15 a grand design to create an outcome, Mr. Chair.
16 This -- this is a -- a scientific and objective
17 modelling exercise that has resulted in outputs that
18 we've discussed here.

19 Q Okay. Well, Mr. Houston, we'll continue to explore how
20 this model was put together, but first of all, let's
21 look -- we now have this transcript page up. And at
22 the top of -- at the bottom of page -- PDF page 150.
23 So it says here: (as read)

24 A shift in the intensity, duration, and
25 frequency, or IDF, of precipitation
26 events is anticipated according to Kuo.

1 And then if we go over the page to PDF 151, it says:
2 (as read)

3 How -- [so this is line 5.] How has the
4 anticipated change in the shift -- how
5 has the anticipated change to the IDF
6 been considered regarding the impacts to
7 westslope cutthroat trout habitat once
8 the Blairmore and Gold Creek watersheds
9 are significantly altered permanently by
10 mining operation?

11 [And then]

12 A Exactly as I've just mentioned,
13 Mr. Chairman, as once the mine is in
14 place, if there is an extremely dry
15 period -- and, again, thinking about the
16 westslope cutthroat trout, a drought in
17 Gold Creek under current conditions
18 would result in a number of places in
19 Gold Creek where the creek literally
20 dries up -- it doesn't dry up, but it
21 goes -- it recedes into the surficial
22 layer and becomes impassable for fish.

23 So, Mr. Houston, do you recall giving that evidence on
24 November the 5th to my questions on that day?

25 A Yes, I do.

26 Q And so if Gold Creek could literally dry up, as you

1 said on November 5th, and run below the surface, what
2 if the SRK model is wrong and your mining operations
3 are capturing more than 20 percent of the base flow of
4 Gold Creek? Do you agree that fish, such as the
5 westslope cutthroat trout, are then going to be even
6 more threatened than they are now?

7 A So, Mr. Chair, I -- I -- I think what's important here
8 is to understand the difference between base flow and
9 total flow in the creek. When we capture water in the
10 mine, in -- in fact, it's a big sump, and we're pumping
11 water out of the mine, that does draw down the
12 groundwater table in the vicinity of the mine, and
13 Ms. Grainger and Mr. Secord have been discussing what
14 those drawdowns look like.

15 But what we need to keep in mind is that when we
16 pump the water out of the mine, it's got to go
17 somewhere. It doesn't disappear. Where does it go?
18 It goes into the sedimentation ponds, it gets cleaned
19 up, and then it's put back into the creek. So although
20 the base flow, which is the flow in the creek that
21 comes from the groundwater, will reduce, that water is
22 still put into the creek. So it just goes through a
23 different pathway through -- through the pumps and
24 the -- the pipes and the sedimentation ponds to come
25 back into Gold Creek.

26 Q So, Mr. Houston, if your mining operations are

1 capturing more than 20 percent of the base flow of
2 Gold Creek, will that result in more areas of the creek
3 drying up when they would normally be flowing?

4 A So as I've just explained, Mr. Secord, the water will
5 continue to go into Gold Creek, albeit through a
6 different pathway. I've also explained that the creek
7 is not actually drying up; it is going subsurface. So
8 the water is still in the creek. The problem is the --
9 the channel has been destroyed in certain areas, and
10 the water's being allowed to go subsurface. And of
11 course, the fish can't swim underneath the surface of
12 the ground. They -- they have difficulty there.

13 So we're going to do two things. First of all,
14 we're going to fix the -- the flow regime in the
15 channel by reconstructing the channel and putting the
16 water back where it has been historically. That's
17 going to give a contiguous path for the fish to follow.

18 And secondly, as we pump down the -- the
19 groundwater table, as we pump out of the mine pit,
20 we're going to be returning that water that we're
21 pumping through the sedimentation ponds, and that will
22 end up back in Gold Creek as well.

23 So there is no decrease in water. The water
24 doesn't disappear, is what I'm saying, as a result of
25 the mine.

26 Q Do you agree, Mr. Houston, that base flow is really

1 important for the fish and that if the model is wrong,
2 it could be catastrophic for the fish in Gold -- in
3 west -- in Gold Creek?

4 A Well, base flow has -- is -- is important for two
5 reasons: Number 1, the -- the quantity of water that's
6 in the creek. And -- and I've just explained how the
7 quantity doesn't -- except for a -- a minor shift of
8 water from Gold Creek to Blairmore Creek, which we've
9 talked about extensively. But the water doesn't
10 disappear. So it -- it still arrives back in the
11 creek.

12 But the other -- the other important aspect to
13 base flow is in keeping some of the overwintering pools
14 open and -- and -- so that -- that is another factor.
15 We're well aware of that, and -- and -- and that's why
16 we're addressing overwintering pools, and that's why
17 we're monitoring groundwater around Gold Creek as part
18 of this project.

19 Q Mr. Houston, I thought you said earlier that no water
20 was going to go to Gold Creek from the mine site?

21 A No contact water, Mr. Secord. So "contact water" is
22 water that contains an elevated level of selenium.
23 That -- that occurs primarily in the ex-pit dumps where
24 we have the leaching of selenium, and that water would
25 be directed through the SBZ, which -- which will
26 eventually end up in -- in Blairmore Creek after the

1 water's been treated and tested.

2 Q So do I understand it, then, that -- that -- that water
3 from the northeast sedimentation pond, water from the
4 east sedimentation pond, and water from the southeast
5 surge pond will be going to Gold Creek? Is that what
6 you're saying?

7 A Two -- two out of three, Mr. Secord. Two out of three.

8 So the -- the -- the ones that are labelled as
9 "sedimentation ponds" are ponds that are treating water
10 that does not contain elevated levels of selenium. It
11 may contain sediment, which we would settle out in
12 those ponds. The one that you call the "surge pond" --
13 the "southeast surge pond", that water is directed
14 towards the saturated backfill zone and is treated for
15 removal of selenium and eventually ends up in Blairmore
16 Creek.

17 Q Okay. So how does the water from -- how long does it
18 take the water from the northeast sedimentation pond to
19 get into Gold Creek?

20 A After it's been tested for sediment and -- and cleared
21 for return to the environment, hours, days. It's a
22 short time period.

23 Q So how does it get there? Is it pumped into the creek?

24 A It'll likely fault -- flow through a -- a -- a channel
25 that we'll -- we'll create down to the creek.

26 Q 'Cause when I looked at your mine plan, it looked to me

1 like the northeast sedimentation pond and the east
2 sedimentation pond both were dam -- they had dam
3 structures around them; correct?

4 A Yes. Absolutely. They're -- they're containment
5 structures. They're made to hold water, but there will
6 be a -- a -- a mechanism, probably, pumping into a -- a
7 channel to discharge that water to Gold Creek.

8 Q So you've got a spillway?

9 A Something like that, yes.

10 Q And so how much -- and -- and will this then -- this
11 will then flow through overland, will it?

12 A Yes, likely.

13 Q Okay. And so when will -- it does seem very different
14 to the answer you gave me earlier about no water being
15 pumped into Gold Creek. Now you're telling me that you
16 will be pumping water from the northeast sedimentation
17 pond and the east sedimentation pond into Gold Creek at
18 some point?

19 A So I -- I apologize if my previous answers weren't
20 clear. So let me be perfectly clear. Any water that
21 contains elevated levels of selenium will eventually
22 end up in the saturated backfill zone, and that water
23 will be treated, and when it is tested and determined
24 to be suitable for return to the environment, that
25 water will go into Blairmore Creek.

26 Water that is -- is not containing elevated

1 selenium or other metals which only has, potentially, a
2 sediment problem will go to the sedimentation ponds.
3 That sediment will settle out in the ponds, and then
4 that water, which doesn't have selenium or -- or other
5 elevated metals, will return to Gold Creek.

6 Q And if it does -- if it does have selenium or elevated
7 levels of metals or other contaminants, then I take it
8 that that water would remain in the pond until it is
9 either treated or put into the saturated backfill zone?

10 A That's right. We would divert that water to the -- to
11 the saturated backfill zone.

12 Q All right. So if we could turn up Bullet Point
13 Number 7, PDF page 207 of CR Number 3. Bullet Point
14 Number 7 says: (as read)

15 Water-level data and creek-flow data
16 collected between late 2013 and early 2016
17 are representative of the pre-mining
18 steady-state conditions and long-term trends.
19 And this is -- again, this is the "Model Assumptions",
20 Bullet Point 7.

21 So if we could turn up PDF page 66 in CR 4 of
22 CIAR 42, Figure 28. And you will note, if we look at
23 the figure in the top left corner, it shows "Monthly
24 Time Series at Gold Creek Near Frank" running from
25 September 1975 to January 2012. And then underneath
26 that, we have "Annual Time Series at Gold Creek Near

1 Frank", again, running from 1975 to 2011. Those are
2 the numbers depicted there.

3 So I don't know, Mr. Jensen, whether this is a
4 question for you, the hydrologist, but you will note
5 that in the top left-hand corner, the flow over many of
6 those years is less than 1 metre -- 1 cubic metre per
7 second per month; correct?

8 A MR. JENSEN: That's correct.

9 Q And if we look at the bottom of -- the bottom -- bottom
10 graph, we have flow of less than 0.4 cubic metres per
11 second per year in many of the -- in many of those time
12 periods or in several of those time periods; correct?

13 A Yes, that's correct.

14 Q So can you tell me: How is this 2013-to-2016 flow data
15 representative when we have data from the Gold Creek
16 Near Frank Water Survey of Canada Gauging Station that
17 provides historical information on a flow variability
18 from 1975 to 2012?

19 A I -- I apologize, Mr. Secord. Would you mind repeating
20 the question?

21 Q So I drew your attention to "Model Assumptions", Bullet
22 Point 7 --

23 A M-hm.

24 Q -- (as read)

25 Water-level data and creek-flow data
26 collected between late 2013 and early 2016

1 are representative of the pre-mining
2 steady-state conditions and long-term trends.

3 So my question to you is: How is this 2013-2016 flow
4 data used by SRK in its model representative when we
5 have data from the Gold Creek Near Frank Water Survey
6 of Canada Gauging Station that provides historical
7 information on flow variability from 1975 to 2012?

8 A So in -- in conducting the hydrological analysis for
9 this project, we looked at not just the Gold Creek
10 station near Frank but all the regional stations to,
11 you know, do our best to characterize the hydrological
12 regime in the -- in the entire study area. And what --
13 what's quite apparent from the flows in -- measured at
14 Gold Creek is that they systemically -- flows measured
15 at that station are systemically lower in general than
16 at -- even at stations upstream on Gold Creek, which
17 means that there's evidence that whatever's measured at
18 that station isn't representative exactly of the flows
19 in Gold Creek.

20 So, in fact, we were -- we were asked in -- in a
21 number of -- of rounds of information requests -- or it
22 was requested of us to rely more heavily on that
23 information, and time -- you know, through a number of
24 rounds of information requests, we had to push back
25 and -- and decline to do that 'cause we -- we
26 understand -- and we can -- we can demonstrate

1 positively that the flow rates measured at that Gold
2 Creek station, that they're not -- there's something
3 else going on that -- that -- there's some
4 measurements -- a portion of the flow that's not
5 accurately measured at that station.

6 So -- so that -- that's what -- I -- I don't know
7 if I'm answering the question --

8 Q No --

9 A -- correctly here.

10 Q So I think you are. I think what you're saying is:
11 Despite the fact that there are many years between 1975
12 and 2011 where the flow is less than 1 cubic metres per
13 second per month, you're saying that this multiyear --
14 these -- this multiyear low-flow condition has not been
15 accommodated in SRK's model -- in SRK's model base-flow
16 calculations? Is that fair?

17 A MR. HOUSTON: Could we -- could we just have
18 a minute, Mr. Chair, to discuss this? One minute.

19 A MR. JENSEN: Mr. Secord, thank you for your
20 patience.

21 I -- it appears that I may have been referring to
22 a different -- it -- it appears that I may have
23 misunderstood your question. I'm being corrected by my
24 colleagues here. So I'll defer, if I may, to my
25 colleague Dr. Dan Bewley. Yeah. So he'll take --
26 he'll take it from here.

1 A DR. BEWLEY: Hello, Mr. Secord. This is
2 Dan Bewley. Can you hear me?

3 Q Loud and clear. Where are you located?

4 A Hi. I'm in Calgary as well right now.

5 Q Okay. Okay.

6 A So -- yeah.

7 Q I like your accent.

8 A I -- I don't, but I appreciate the compliment.

9 So just to add some context. I was working with
10 Mr. Bettles here in formulating the instream flow
11 assessment. And as I'm sure you're aware, the instream
12 flow assessment uses streamflow data as one of its key
13 inputs. Okay?

14 So in the instream flow assessment, we go into
15 depth around how stream flows specifically in the
16 channel because that's what we care about in terms of
17 modelling fish habitat in the channel itself. How --
18 we characterize how conditions have changed spatially
19 along each creek and temporally over the record period.

20 So to answer your question directly, if we could
21 turn to CIAR 44, please, Addendum 1, CR 6, Appendix A3,
22 and then if we can go to PDF page 37. Okay. So what
23 we're looking at here is essentially the same plot.
24 It's from Gold Creek since records began in 1975, and
25 I've highlighted two areas here.

26 One is in yellow, and one is in blue. The area in

1 yellow is essentially when our hydrometric monitoring
2 in the area began. It was at the very end of 2013 into
3 2014. It's a higher flow year.

4 In the blue area, which is essentially when a lot
5 of our instream flow work was conducted, you can see
6 it's obviously a dry year. So between those two
7 periods, we have quite a high year and quite a low year
8 captured in the data. And that kind of puts it into
9 context over the longer term since those records began
10 in the mid-1970s.

11 Does that answer your question, or would you like
12 me to expand?

13 Q No. That's -- thank you.

14 Now, I don't know whether this is for you,
15 Mr. Bewley [sic], or for Mr. Jensen. Do you agree that
16 the importance of springs to the flow in Blairmore and
17 Gold Creeks has not been addressed very well in Benga's
18 application?

19 A MS. GRAINGER: Mr. Secord, it's Nancy
20 Grainger. We did review springs in the hydrogeology
21 report, so we completed a field investigation and
22 sampling program. All of the springs that were
23 identified on the project site were related to
24 historical mining activities. And we reviewed as well
25 any published data regarding springs in the area. So
26 that's the information that was available regarding

1 springs on the project site, if that's helpful.

2 Q Do you agree that numerous small springs are known to
3 exist in the area, and the discharge of groundwater at
4 surface forms wet area habitat as well as flow down the
5 flanks of Grassy Mountain down to the valley bottoms?

6 A I don't know if it's helpful. We can pull up a map
7 that shows the wetlands that are mapped within the
8 project area. There are a very limited number of
9 wetlands that mapped, but we can look at that if that's
10 helpful, Mr. Secord.

11 Q Not -- not really. The question was: Do you agree
12 that numerous small springs are known to exist in the
13 area, and the discharge of groundwater at surface forms
14 wet area habitat as well as flow down the flanks of the
15 Grassy Mountain down to the valley bottoms?

16 A MR. HOUSTON: Mr. Secord, is there -- are
17 you reading from a specific passage in our application
18 or --

19 Q No, I'm not, Mr. Houston. I'm asking a question. If I
20 was asking -- if I was referring to your application,
21 I'd have it up in front of you. Trust me.

22 A Okay.

23 Q I'm not -- this isn't -- this isn't a test on your --
24 what is it, 20,000 documents is it, or pages? I don't
25 think we're doing that. So it's just a very simple
26 question. I would've thought Ms. Grainger could've

1 asked -- answered that.

2 A Let -- let us just have a little discussion here, and
3 then we'll give you an answer.

4 Q Maybe -- maybe -- maybe this question too: Every
5 headwater tributary starts at a spring; is that
6 correct?

7 THE CHAIR: Apologies. We appeared to
8 have lost the Zoom connection for a moment or two. I'm
9 not sure if everybody's able to rejoin now or not.

10 MR. SECORD: Mr. Chair, should we take our
11 mid-morning break --

12 THE CHAIR: Yes. I think that's a --

13 MR. SECORD: -- while we're --

14 THE CHAIR: I think that's a good idea.
15 So let's take 15 minutes. It's 10:28. We'll resume at
16 10:45.

17 MR. SECORD: Thank you, sir.

18 (ADJOURNMENT)

19 THE CHAIR: So, Mr. Secord, before we
20 start, there was some kind of a disturbance in the
21 force just before that break. I lost my Zoom
22 connection, as did Mr. O'Gorman and a couple of AER
23 staff. It wasn't for very long. And the last thing we
24 recall before we lost our connection was you asking a
25 question, and the question was along the lines of: Do
26 you agree that -- do you agree that numerous small

1 springs are known to exist in the area and the
2 discharge and groundwater surface forms wet area
3 habitat? And then that was kind of the end of what we
4 heard.

5 So if we could maybe just back up, and if there
6 was a response provided to that question, if it could
7 be repeated.

8 MR. SECORD: Yeah. I think where we were
9 was they wanted to break and discuss it.

10 THE CHAIR: Okay.

11 MR. SECORD: So it looks like you didn't
12 miss anything at all.

13 THE CHAIR: Okay. Thank you.

14 A MR. HOUSTON: So -- so, Mr. Chair, we'll --
15 we'll provide an answer to that question now, just to
16 make sure everybody's on the same page.

17 But before we do that, Mr. Secord, you and I had a
18 discussion about whether the sedimentation ponds were
19 within 100 metres, and we've -- we've confirmed over
20 the break that they're more than 100 metres but close
21 to 100 metres away from Gold Creek. Just -- just to be
22 clear, they're not closer than 100 metres; they're --
23 they're approximately 100 metres away.

24 Q MR. SECORD: Okay. So, Ms. Grainger.

25 A MS. GRAINGER: Thank you.

26 We don't need to turn to it, but in CIRA --

1 CIAR 42, Consultant Report Number 3, PDF page 34, there
2 is a discussion and a review of natural springs within
3 the project area as part of the hydrogeology assessment
4 report. So that reviews known information about
5 springs in the area. In short, there are only a small
6 number of springs that were identified within the
7 project area itself, and they are all related to
8 historic mining activities.

9 So within the upper portion -- not talking about
10 the creeks themselves or along those -- the creek
11 valleys, but within the upper portion of the project,
12 there's a very limited number of springs that have been
13 identified in the project area.

14 And I'd like to ask my colleague Mr. Bettles to
15 add to this response.

16 A MR. BETTLES: Hi, Mr. Secord. Apologies. I
17 was on mute for a second there.

18 To follow up to Ms. Grainger's response, we've --
19 through our field surveys along Gold Creek, we have
20 noted base flow that daylight and enters into Gold
21 Creek itself, but we have not documented any habitat
22 that you could construe as being off channel or what
23 have you that would provide that extra habitat for
24 westslope cutthroat trout.

25 Q Okay. I think probably for Ms. Grainger. Do you agree
26 that the flow from these features adds directly to the

1 creeks via tributary drainage and provides base-flow
2 contributions to the streams?

3 A Mr. Secord, I can -- I'll try to answer your question
4 for you. The -- the tributaries along the west side of
5 Gold Creek are, for the most part, ephemeral, so at
6 times, they may offer some -- some contribution, but it
7 would be very little that they are contributing. I
8 will point out that the Caudron Creek from the east is
9 a major contributor to Gold Creek.

10 Q Do you agree that very few springs -- only six were
11 assessed during the preparation of Benga's application?

12 A MR. HOUSTON: So, Mr. Chair, if I could sum
13 up a little bit what we've heard here, that -- that
14 there are -- there are very few springs high up in the
15 project, but if you look right along the banks of Gold
16 Creek, there are a number of places where -- we
17 classify it as "base flow" is visible coming from the
18 side of the creek, and -- and I understand that those
19 are the features that Mr. Secord is describing here,
20 and -- and so we -- we would've evaluated those as part
21 of the base-flow contribution to Gold Creek.

22 Q So, Mr. Jensen, given their importance, why were so few
23 springs assessed, and how does this speak to the
24 accuracy of the SRK groundwater modelling?

25 A MR. JENSEN: Mr. Secord, I'm afraid I have
26 to defer that question to my colleagues. Again, I did

1 not do the groundwater model --

2 Q But --

3 A -- assessment.

4 Q Okay. Well, is it -- would springs be part of
5 hydrology or hydrogeology?

6 A MS. GRAINGER: Mr. Secord, I can answer.

7 So the springs were reviewed and examined both
8 from published information and part of -- field surveys
9 as part of the hydrogeology portion of the baseline and
10 the assessment. And that's in the section that I
11 referred to just earlier. We reviewed all the springs
12 that were on record and that we could identify within
13 the project area on the project site, so those are
14 described. And there's a very limited number of
15 springs that were identified in the project site.

16 Q So how does this speak to the accuracy of the
17 groundwater modelling?

18 A I -- I don't think it has any impact on the groundwater
19 modelling. The -- the model does talk about the
20 springs that were monitored, as they're considered in
21 the model itself, but it means that all information
22 that we understand and know about the site was
23 considered in the development of the groundwater
24 numerical model.

25 Q Okay. Just --

26 A MR. HOUSTON: If -- if I could just add to

1 that.

2 Q Just before that, Mr. Houston.

3 Do you agree, Ms. Grainger, that there have to be
4 more than just six springs, because all headwaters --
5 streams originated at a spring area; correct?

6 A So, Mr. Secord, that's precisely the point I was going
7 to just clarify, if I could. We have -- we have
8 included base flow in Gold Creek in -- in our
9 modelling, and we have -- and -- and I think a lot of
10 the features that you're referring to as "springs" may,
11 in fact, be a base flow that happens to be coming out
12 from -- from the bank or a little bit -- you know, at
13 the -- adjacent to -- to the creek. So we -- we've
14 included those in our modelling as -- as base flow.
15 I -- I'm just not sure if that was clear.

16 Q Okay.

17 A Base flow doesn't all come up from the bottom of the
18 creek. It -- it sometimes comes in from the side.

19 Q Okay. So, Mr. Bewley, could you pull up that figure
20 again that you had us look at for instream flow needs?

21 A DR. BEWLEY: Certainly. So can we go back
22 to CIAR 44, Addendum 1, CR 6. There we go. Thank you.

23 Q Okay. So just to refresh your memory, are you familiar
24 with the SRK model?

25 A At a basic level, yes.

26 Q Okay. So we've already had this up on the screen -- we

1 don't need to pull it up -- Bullet Point 7 from PDF
2 page 207 of CR Number 3, which says, as part of the
3 model setup: (as read)

4 Water-level data and creek-flow data
5 collected between 2013 and early 2016 are
6 representative of the pre-mining steady-state
7 conditions and long-term trends.

8 So that's what SRK wrote in their model design.

9 I then had Mr. Jensen look at Figure 28. I think
10 that's right. Yes, Figure 28 -- we don't need to pull
11 that up -- from, basically, the flow records for Gold
12 Creek at Frank Regional Station and the low flows that
13 were shown there.

14 And then, Mr. Bewley, you came -- you came into
15 the picture, and you pulled up Figure 3.5 from
16 Section E -- this is from Section E of Exhibit 42;
17 correct? This is from the EIA?

18 A MR. HOUSTON: That -- that's correct, Mr. --

19 Q Okay. So --

20 A -- Secord.

21 Q So as I understand it, you -- the modellers used 2013
22 and 2016 to capture some variability. So in that
23 period of time, you had those extremely high flows,
24 which are marked with the yellow line, and you had some
25 extremely low flows marked by the turquoise line;
26 correct? That's what you said, Mr. -- I'm talking to

1 Mr. Bewley now.

2 A Yeah. I -- I -- I understand that, Mr. Secord, but
3 I -- I think what you're asking is a question that
4 integrates across a number of fields. So it might be
5 more helpful if I provide a -- an integrated answer
6 here.

7 Q I don't think so, but I think you're going to do it
8 anyway, Mr. Houston.

9 A You -- you understand me very well, Mr. Secord.

10 So what we have on this graph is -- the black line
11 is the -- is the hydrometric station near Frank, and,
12 of course, the data goes back from 1975 up to 2017.

13 Since 2013, '14, we've had other hydrometric
14 information from Gold Creek based on other measuring
15 stations, monitoring stations, and that helps us to
16 understand where the water's coming in in a more
17 detailed way.

18 And -- and so what this graph shows quite nicely
19 is that -- that detailed information that we've used
20 for the -- the modelling of the subsurface flows is
21 based on the detailed information from 2013 to 2017.
22 And what this shows is that that detailed information
23 is truly representative of the range of flows that we
24 could see in Gold Creek. And that -- that's shown
25 because in 2014, we had a -- a high-flow year, and in
26 2016, we had a low-flow year. So by -- by capturing

1 the detailed information over that time range, we have,
2 in fact, captured the range of variability on -- on
3 that stream.

4 Q Okay. So -- so, Mr. -- I don't know. Mr. Bewley or
5 Ms. Grainger, do you agree that you have used two --
6 and I think you misspoke, Mr. Houston, already, because
7 the modellers didn't use 2017. So --

8 A Yeah. You're right. Two thousand -- 2016.

9 Q And so -- whatever.

10 Ms. Grainger, do you believe -- do you -- do you
11 agree that you have -- that basically SRK have used
12 2013 to 2016 to capture some variability in flow
13 conditions, but have failed to capture the multiple
14 years of low flow in the 1975-to-2012 record, and that
15 if base flow is reduced by drawdown and low flow occurs
16 over multiple years, what happens to the fish?

17 A DR. BEWLEY: Can I -- Mr. Secord, this is
18 Mr. Bewley again. Can I add some context to the series
19 of low flows that you see on the graph in front of us?
20 Primarily, you know, the 1980s.

21 So let's -- let's add some context when we discuss
22 variability at a certain location. It's important that
23 we discuss the period in question, so here from 1970.
24 We've shown in other documents and maps -- and I can
25 guide you to one if you'd like -- Gold Creek has been
26 subject to a lot of anthropogenic disturbance, and by

1 that we mean forestry and agricultural activity as
2 well. And this was, we think, going on during this
3 kind of, you know, first half of the period in which we
4 see here.

5 So what that means is Gold Creek was more heavily
6 forested in this early section. As those disturbances
7 have escalated over time, then that would essentially
8 explain why we're trending slightly upwards over the
9 long-term period at Gold Creek.

10 If you -- do you want to see a map of disturbance?
11 I can direct you there if you'd like.

12 Q What is the long-term MAD?

13 A It's around .66 --

14 Q And what does MA --

15 A -- depending on -- sorry.

16 Q What does it stand for? What does "MAD" stand for?

17 A "Mean annual discharge."

18 So .66 means 660 litres per second coming, on
19 average, through the year.

20 Q Okay. All right. I think -- I think that's enough.
21 Given the list of -- length of questions I have,
22 Mr. Bewley, I'm -- I think I better press on if I'm
23 going to ask them all.

24 So I think, Mr. Houston, this is -- you'll be
25 happy to know this question's probably for you. The
26 saturated backfill zones, SBZs or SBZs; rock dumps and

1 water management ponds; sedimentation and surge ponds;
2 and the end-pit lake, or EPL, they will all be
3 established on top of bedrock; is that correct?

4 A MR. HOUSTON: So all of the features are
5 obviously on the site. We haven't done exhaustive
6 geotechnical investigation at all of the sites. So
7 some of the features we're going to want to go in
8 before we do our detailed engineering and gather more
9 information about the -- the subsurface conditions.

10 Q Sure. And in relation to -- I'm thinking in relation
11 to the northeast sedimentation pond, the south --
12 sorry, the east sedimentation pond near some of my
13 clients' properties, they would be established on
14 residual soils basically covering the areas outside of
15 the mine pit?

16 A Yeah. So I -- those are areas where we -- we need to
17 do a -- a little bit more geotechnical investigation to
18 determine just how -- how deep that goes. Those
19 features will be something like 10 metres deep at their
20 deepest point, and so we're -- we're going to have to
21 do additional drilling to understand, you know, where
22 is the bedrock in these areas.

23 Q And do you agree there is a lack of information
24 regarding the physical and chemical nature of the
25 bedrock below the mine footprint?

26 A I'm -- I'm not -- for what purpose, I -- I guess is the

1 question I --

2 Q Well, let's just take it one at a time. Let's say the
3 east settling pond. Do you agree that there is a lack
4 of information regarding the physical and chemical
5 nature of the bedrock below the east settling -- the
6 east sedimentation pond near Fran Gilmar's property?

7 A So it -- it depends on what you need the information
8 for, Mr. Secord. If -- if it's for designing the pond
9 and the dam, absolutely we need to gather more
10 information to ensure that we build a safe structure,
11 and that would be part of the dam design.

12 Is that the direction of your question?

13 Q I'm correct? There is a lack of information regarding
14 the physical and chemical nature of these water
15 management ponds that you're going to establish on the
16 east side of the project area?

17 A Less chemical, more physical, but, yeah, we -- we would
18 need more information to do a detailed design.

19 Q And -- and why -- why haven't you got that information?

20 A Well, many reasons. One, it's a disturbance on the
21 landscape. Secondly, it's not required at this point
22 in time. We're confident that understanding the
23 general nature of the -- the terrain and the -- the
24 geological setting, that a design can be achieved. But
25 absolutely once -- once we get the go-ahead to go ahead
26 with the project, we'll have to gather more information

1 to do the detailed design for those -- for those dams.

2 Q Do you agree that there is potential for trace elements
3 to be mobilized from the underlying soil and bedrock --
4 for instance, the Fernie Group materials -- once the
5 water management ponds are in place near Fran Gilmar's
6 property and north of her property, the northeast
7 sedimentation pond?

8 A By -- by virtue of having dug the ponds?

9 Q So do you --

10 A Is that what you're --

11 Q Exactly. Do you --

12 A No.

13 Q -- agree that there is a potential for trace elements
14 to be mobilized from the underlying soil and bedrock
15 materials once these water management ponds are in
16 place?

17 A No. No, I wouldn't think so, Mr. Secord.

18 Q Yeah. But you already said, We don't know anything
19 about the underlying soil and bedrock. So how can you
20 say that?

21 A Well, because the interface between the -- the -- the
22 base of the pond and -- and the water is a -- a finite
23 area. It's -- it's not like the -- the -- the rock
24 spoil pile, for example, where you've got millions of
25 tonnes or thousands of tonnes of fractured rock.

26 What we're talking about is a -- a discrete pond,

1 and -- and if -- if we were to determine that there was
2 a potential, we could always go to something like a
3 pond liner or a clay base to the pond to -- to minimize
4 any effects. Those -- those things are all things that
5 we will analyze when we do the additional geotechnical
6 work, and -- and they'll -- they'll inform the design
7 of the ponds.

8 Q Yeah. So I think you were already asked whether there
9 were plans to prepare the grounds beneath these water
10 management ponds, and I think you said that you would
11 not be lining the structures. I think you --

12 A Again, that -- that's -- that's our -- that's our
13 preliminary assumptions based on what we understand
14 about the geology of the area. We -- we believe these
15 ponds are going to be sitting on bedrock, that it won't
16 be highly fractured or -- or, you know, it's not going
17 to be a really permeable base, and -- and so for the
18 purpose of a sedimentation pond, that -- that doesn't
19 seem to require a liner.

20 Q But at this point, you don't know whether the bedrock
21 contains fractured shale or sandstone in the areas of
22 the ESP or NESP or SESP?

23 A Yeah. So to be clear, the sedimentation ponds,
24 Mr. Secord, are -- are going to contain water that
25 is -- is not contaminated with any metals. It will
26 be -- have a high sediment load. If some of that water

1 seeps into the groundwater, it's -- it's -- it's not
2 something that would have an impact.

3 Q So yesterday you indicated that you would install
4 liner -- liners for the gravel bed reactors; correct?

5 A Again, that's part of a gravel bed reactor design.
6 That's -- that's a typical design for a gravel bed
7 reactor, to have liners above and below the -- the --
8 the part that's filled with gravel. So that's a
9 specific structure that would be designed to treat
10 water.

11 Q So if you can do that for the gravel bed reactors, why
12 can't you do it for the NESP, the ESP, and the SESP?

13 A We can do a lot of things, Mr. Secord. The question is
14 whether it's required or not, needed to be protective
15 of the environment, and -- and that's an assessment
16 that -- our preliminary assessment is it's not
17 required. But that will be reviewed when we get more
18 geotechnical information in those areas.

19 Q So once the -- once the NESP, ESP, and SESP are in
20 place, will water leach out picking up metals and
21 taking them off to Gold Creek?

22 A Mr. Secord --

23 Q Maybe just do maybe one at a time.

24 A Okay.

25 Q Yeah.

26 A So the sedimentation ponds have clean water. It's --

1 it's no different than water falling on the ground
2 today. It -- it's going to go -- move through the
3 groundwater system, and -- and as you can plainly see,
4 there's -- there's no leaching effect that happens
5 naturally today. The --

6 Q Sorry. I don't understand that. I'm sorry.

7 A Okay. If a -- if a raindrop falls on the ground
8 today --

9 Q Right.

10 A -- some of the -- the water goes into the groundwater.
11 We agree on that --

12 Q Right.

13 A -- right?

14 Q Right. Right.

15 A Okay.

16 Q But -- so now you're -- now you're create -- now you're
17 creating a structure on top of --

18 A Yeah.

19 Q -- on top of the ground at the NESP and ESP, for
20 example? You're going --

21 A Yes.

22 Q -- to, then, impound water into that --

23 A Yes.

24 Q -- structure?

25 A Yes.

26 Q You're not going to line these structures. The

1 question, then, is: Is there potential for trace
2 elements to be mobilized from the underlying soil and
3 bedrock and to actually then pick -- you know, for this
4 water to pick up metals and take them off to Gold Creek
5 as it infiltrates through these unlined ponds? That's
6 the question. I don't know whether it --

7 A Okay.

8 Q -- may be -- maybe a geochemist we might want to answer
9 that for you. I don't know. Or maybe that's your
10 expertise as well. I don't know.

11 A I'm -- I'm by no means an expert, but there is
12 groundwater there. We've been talking about drawdown
13 of the groundwater this morning. So today there is
14 groundwater. That means there's water in contact with
15 the rock beneath the areas where we'll put these ponds
16 today, and Mother Nature doesn't seem to have a problem
17 with that, so we're not doing -- we're not creating a
18 new circumstance. There will be -- there is water
19 there today; there will be water there when these
20 structures are built.

21 Q But there's nothing like the amount of water that
22 you're going to put in place. Now you're creating
23 these artificial ponds at the NESP and ESP, and
24 presumably this water is going to then slowly -- what
25 is slowly -- basically is slowly going to leach out of
26 these ponds into the underlying hydrological regime.

1 Is that what you're saying?

2 A It -- so the base of the pond -- the base of the ponds
3 is within the groundwater zone, Mr. -- Mr. Secord. So
4 the water's already there. Today the water is there.

5 Q Right?

6 A And -- and there's no leaching happening, at least none
7 that Mother Nature can't manage.

8 Q You're going to be putting, though, a lot more water in
9 place in those ponds, correct --

10 A It's not --

11 Q -- (INDISCERNIBLE - OVERLAPPING SPEAKERS) is there?

12 A It's not about the quantity. It's the fact that the
13 rock is wet today, and so leaching is happening today,
14 and -- and the rock will be wet tomorrow. So it --
15 it -- I don't know how else to explain it, Mr. Secord.

16 Q Am I not correct that the GoldSim model says the water
17 in the ponds will be impacted by trace elements?

18 A Again, the -- the -- the sedimentation ponds -- no,
19 you're not correct. That water is water that is not
20 contact water. It doesn't have trace elements.

21 If you're talking about the surge pond, the
22 specific function of the surge pond is a collection
23 point for water that has been in contact with the waste
24 rock dump and will have picked up trace elements like
25 selenium in the waste rock dump.

26 Q And you would agree that Mother Nature is already

1 showing some trace elements in the groundwater based on
2 Benga's baseline monitoring?

3 A Mr. Chair, in our baseline monitoring, we have detected
4 some trace elements. That's not unusual in -- in
5 topography like this.

6 Q How does the deficiency of information regarding the
7 soil and bedrock beneath the mine pit, rock dumps,
8 water management ponds, the NESP, ESP, and SESP, and
9 the EPL provide the Joint Review Panel with any
10 confidence that we actually know what will happen once
11 everything is in place?

12 A Mr. Chair, I -- I think it's important to understand
13 the difference between the decision in front of the
14 Joint Review Panel today and the ongoing regulatory
15 process that governs the -- the design and construction
16 in particular of -- of ponds and -- and dams and other
17 structures on -- on this mine.

18 Regulation doesn't end with the JRP decision.
19 Regulation continues, and we will expect ongoing
20 monitoring. We're going to expect to submit detailed
21 design drawings to -- to the regulators for review and
22 approval prior to construction. So the -- the
23 regulation doesn't end with this decision, and we're
24 not expecting this JRP to evaluate the design of a --
25 of our -- our water management structures.

26 MR. SECORD: Zoom Host, if you could please

1 turn up "Model Properties", Bullet Point 3, PDF 209 of
2 CR 3 in CA -- CIAR Number 42.

3 A I missed the PDF page, Mr. Secord.

4 Q MR. SECORD: 22 -- 209. And it reads in
5 part: (as read)

6 'K' decreases with depth due to increases in
7 the lithostatic stress.

8 And am I correct, Ms. Grainger, that, put another way,
9 the model assumes that 'K' decreases with depth as a
10 result of the increase in lithostatic stress or
11 pressure from the weight of the overlying rock?

12 A MS. GRAINGER: Yes, that's correct.

13 Q So you and I can agree that up to 430 metres of Grassy
14 Mountain will be removed to gain access to the coal
15 with waste rock being redistributed in dedicated dump
16 areas?

17 A That's correct.

18 Q And you will agree that the removal of this overlying
19 weight of material will cause k-values in underlying
20 and adjacent formations to increase and, in some
21 cases -- to increase in some cases and decrease in
22 others; correct?

23 A I think it's -- it's probably debatable. This is --
24 relationship is not just based on the weight of the
25 rock, but also the fact that shallower rocks are
26 subjected to freeze-thaw cycles and develop joints

1 which increases the conductivity; right?

2 So just because we unload the rock and expose it
3 and it's now at a shallowing depth doesn't necessarily
4 mean that the 'K' would immediately increase according
5 to its -- its new depth.

6 Q But it certainly could happen?

7 A It could. I think, you know, in terms of the numerical
8 model, had we altered the conductivity, it would've
9 affected a very small number of cells essentially in
10 the shell of the mine, so -- because once you get far
11 enough from the pit, they're still at -- at depth;
12 right? So it would really only affect cells
13 immediately adjacent to the mine pit.

14 And the net effect of that would be, I think,
15 insignificant on the model results because it --
16 those -- that small rim, if you will, of higher
17 conductivity values, if that occurred, would still be
18 surrounded by a host rock of a lower conductivity
19 that's ultimately going to determine groundwater flow
20 conditions within the mine site.

21 Q So I think you answered my next question. This
22 transient change in k-values -- this transient change
23 in k-values has not been accommodated in the SRK model
24 simulation?

25 A That's correct. It was not included in the model.

26 Q And then my understanding is that you've also answered

1 my next question based on your position as answering
2 the questions on the model for SRK. Given that it has
3 not been accommodated in the model simulation, your
4 view is that this will not affect the model results
5 regarding groundwater drawdown extent? That's your
6 evidence?

7 A MR. HOUSTON: Mr. Secord, I think I heard
8 the opposite, that it wasn't included because it wasn't
9 considered to be a significant factor, not -- not that
10 it wasn't included --

11 Q Okay. I think, Mr. Houston --

12 A So -- so --

13 Q Mr. Houston --

14 A Yeah.

15 Q -- you know, unfortunately, your interjections are
16 delaying my cross-examination and taking up time that
17 probably doesn't need to be taken up.

18 So I think it's pretty clear what Ms. Grainger's
19 evidence is: The transient change in k-values has not
20 been accommodated in the SRK model simulation. My
21 question to her was very specific, really didn't need
22 your interjection, and so I just want to get
23 Ms. Grainger's answers.

24 Ms. Grainger, given that it has not been
25 accommodated in the model simulation, I take it it's
26 your evidence that it will not have any effect on the

1 SRK model results regarding groundwater drawdown
2 extent?

3 A MS. GRAINGER: My evidence was that it would
4 not have a significant influence on the predictions of
5 the model.

6 Q Okay. So -- so it's not -- so thank you, Mr. Houston.
7 You were right.

8 So it's the case of not -- so you're not saying it
9 won't have any effect, but it -- the effect will not be
10 significant. Do I have that right?

11 A That's correct. As I described, it would affect a -- a
12 small rim -- you know, a narrow margin of rocks in the
13 vicinity of the mine pit shell. The rock beyond would
14 remain at the original conductivity values, and so,
15 therefore, those lower conductivity host rocks, if you
16 will, would ultimately determine the behaviour of
17 groundwater and the drawdown predictions.

18 Q Okay. Thank you for that.

19 And my apologies, Mr. Houston, but that's not an
20 invitation to jump in. Okay?

21 If we can turn into -- turn up Figure 3-4 on
22 PDF page 214 of CR Number 3.

23 So here we have the SRK Figure 3-4, "Boundary
24 Conditions"; correct, Ms. Grainger?

25 A Correct. I don't know if you want to bring up CIAR 70,
26 PDF page 110. There was a revised version of this

1 figure provided.

2 Q I don't think we need to because I know that obviously
3 the definition of -- and I'm familiar that they did
4 change it 'cause you -- it's hard to read these
5 constant headnotes and --

6 A Correct.

7 Q -- seepage notes.

8 But I'm more interested in the -- I -- the figure
9 that really didn't change, which is in the bottom
10 left-hand corner. That's what I'm really wanting you
11 to focus on.

12 A Sure.

13 Q So in the lower left corner of Figure 3-4, the model
14 configuration shows that the area of the mine pit is
15 dealt with using inactive cells and does not show the
16 presence of an excavation?

17 A That's correct.

18 Q And this is the SRK model's boundary conditions. Red
19 cells are inactive from a flow perspective, but you
20 still see "Topography" there; correct?

21 A Correct. But it -- it removes them from the influence
22 of the model.

23 Q How does this model configuration impact the drawdown
24 simulation results given that it is not reflecting the
25 anticipated increase to local k-values beneath and
26 adjacent to the mine pit once the weight of Grassy

1 Mountain has been removed?

2 A I believe we've discussed that already, Mr. Secord,
3 that were we to accommodate a -- a change in
4 conductivity in the model, it would affect, really,
5 just the cells, as you can see, adjacent to the
6 inactive ones, so a very small number of cells with
7 respect to the entire model.

8 Q Okay.

9 A Did that answer your question?

10 Q I take it that's your view, and we've -- and we've
11 discussed that earlier; correct?

12 A Correct. We've discussed that earlier.

13 Q If we could turn up PDF page 210, Figure 3-2 of
14 CR Number 3. And this is the "Model Mesh"?

15 A Correct.

16 Q And if we look at the figure on the right-hand side,
17 we -- it shows the 40-metre vertical meshing; correct?

18 A Yes, that's what's labelled there.

19 Q And the ground -- the SRK groundwater numerical model
20 comprises nine layers that appear to be oriented in a
21 horizontal manner, yet the formation in the area is
22 tilted heavily toward the southwest; correct?

23 A Correct. So the layers are orientated in a relatively
24 horizontal manner, but that was addressed through
25 essentially applying -- and there's a figure -- if I
26 can just find it. But applying the conductivities at

1 angles relative -- so on PDF page 212, and there are
2 several diagrams that show -- sorry. I'll wait till it
3 pulls up.

4 Yeah. So you can see there the orientations of
5 the conductivity tensors that are shown. So although
6 the units are -- appear to be flat-lying, the
7 conductivity is orientated in such a way as to be
8 representative of the structure of the -- the
9 geological units.

10 Q How does the horizontal orientation of the SRK model
11 layers affect the model outcomes?

12 A I think what's important is that the conductivities are
13 orientated in such a way that -- that that's what's
14 driving the flow in the model.

15 Q How does the draping of the model layers affect the
16 model outcomes?

17 A Well, there was a structure superimposed. We can also
18 look to a description of the geological model that was
19 utilized and input into this and then, in fact,
20 informed the orientation of these conductivity tensors
21 throughout the model. So the geological model was used
22 to represent Coal Seam 1 that was then applied
23 throughout the model, and that orientation of Coal
24 Seam 1 was, in fact, used to determine the orientation
25 of the conductivity tensors. So although the model
26 might appear simplistic with just horizontal layers, in

1 fact, the structure is -- is -- is reproduced within
2 this model in that method.

3 Q If we could turn up the first full paragraph, PDF
4 page 74 of CIAR 533 from Dr. Fennell's report.

5 And while we're -- while we're looking for that --

6 A MR. HOUSTON: Should that be 553,
7 Mr. Secord?

8 Q It probably should. Yes. Thank you.

9 So, Ms. Grainger, in relation to your last answer,
10 what about faults? I thought this was a fault-dominated
11 model.

12 A MS. GRAINGER: Sorry. Mr. Secord, what would
13 you -- with respect to faults, what would you like
14 to -- me to explain?

15 Q I thought the area was fault-dominated.

16 A So there are -- sorry. I'm just going to find a
17 figure. In CIAR 42, Consultant Report 3, PDF 257,
18 there's a map that shows the distribution of the thrust
19 faults that was -- that were mapped within the project
20 site. These were considered in a separate sensitivity
21 analysis of the model, so they were assessed by both
22 increasing and decreasing the conductivity along these
23 zones by two-and-a-half orders of magnitude. So this
24 was a separate analysis to look at the impact of these
25 significant or, you know, these known features and
26 whether they have an effect on the model predictions.

1 So those are just the page up on 256, I believe.
2 Geological structure at the bottom of the sensitivity
3 table describes the results of both increasing and
4 decreasing the conductivity along those structures and
5 the effect that that had on the hydraulic head and the
6 base flow. So it had a low effect by increasing the
7 conductivity and -- on hydraulic head, but in all other
8 cases, it was seen to be less than 5 percent difference
9 to the model predictions.

10 Does that answer your question, Mr. Secord?

11 Q Yes. Thanks.

12 MR. SECORD: If we could turn up,
13 Zoom Host, CIAR 553, PDF page 74. This is the
14 Coalition submissions.

15 Q MR. SECORD: And just while we're waiting
16 for that, Ms. Grainger, you would agree with me that
17 the north-south faults were mapped to basically impede
18 flow in an east-west direction? In the SRK model.

19 A MS. GRAINGER: They were considered in two
20 different ways, as we've discussed. So the one way
21 we've just reviewed, which was they were specifically
22 evaluated as both a barrier and a conduit. So the
23 effect of that was reviewed through the sensitivity
24 analysis.

25 Q Okay.

26 MR. SECORD: Now, Zoom Host, are you able

1 to pull up 553, CIAR 553?

2 THE CHAIR: This appears to be 553. Is it
3 not?

4 MR. SECORD: Oh, it is. I'm sorry. Thank
5 you.

6 Q MR. SECORD: So in the first full
7 paragraph, Dr. Fennell writes: (as read)

8 Similarly, the assumption of an average
9 twenty -- of a 28 percent of mean annual
10 precipitation map as a -- as the recharge
11 input to the model is high given documented
12 mountain front-block recharge estimates,
13 i.e., a range of less than 1 percent to
14 38 percent with an average of around
15 11 percent and a geometric mean of around
16 6 percent.

17 And then he footnotes to a paper by Wilson and Guan.
18 And if we could pull up Aid to Cross AQ Number 3. This
19 is a paper by Wilson J. and Alan [sic] Guan, "Age 2004
20 Mountain-Block Hydrology and Mountain-Front Recharge".
21 And, Ms. Grainger, have you reviewed this paper?

22 A MS. GRAINGER: I have reviewed this paper.

23 Q And do you take -- do you have any issue with
24 Dr. Fennell's statement: (as read)

25 Similarly, the assumption of an average of
26 28 percent of mean annual precipitation MAP

1 as the recharge input to the model is high
2 given documented mountain front block
3 recharge estimates, i.e., range of less than
4 1 percent to 38 percent with an average of
5 around 11 percent and a geometric mean of
6 around 6 percent.

7 A I have concerns with the applicability of this paper to
8 the project site. I note that the precipitation that's
9 identified for the sites that are reviewed in this
10 paper are generally considerably lower than we see at
11 Grassy. I also note the geology is substantially
12 different. These are typically volcanic and igneous
13 rocks as opposed to sedimentary. So I have concerns
14 about the applicability of this paper. And the -- the
15 statistics that you quote, I haven't recalculated
16 those.

17 Q So do you disagree that the values reported in the
18 literature for mountain-front recharge are generally
19 less than 28 percent, with an average of 11 percent and
20 a geometric mean of 6 percent?

21 A I think what's relevant is: Despite my concerns,
22 the -- the -- this paper identifies a range of percent
23 recharge, which is in -- within the range that we have
24 used in the numerical model.

25 Furthermore, I think what's important is that
26 recharge was part of the calibration process in order

1 to reproduce, within a statistical range, the base
2 flows that are observed at Grassy Mountain. Recharge
3 was modified, and so the model is internally consistent
4 in terms of predicting base flow with the recharge that
5 was applied.

6 Q Well, in fact, SRK have used recharge of in excess of
7 55 percent of the MAP in certain areas of the mine
8 site; correct?

9 A Well, as we've reviewed this morning, it -- it varies
10 considerably across the model area.

11 Q Okay. All right. Well, let's turn up PDF 21 --
12 page 213 of CR Number 3 and CIAR 42.

13 So under the heading "Recharge", it states:
14 (as read)

15 Recharge for precipitation and snow melt is
16 applied on the top slice and is assumed to
17 follow a similar relationship to that
18 observed between MAP and elevation. Recharge
19 rates were calibrated to the base and
20 alternative calibration models that matched
21 the base-flow estimates for Gold Creek,
22 Blairmore Creek, and Daisy Creek for both
23 steady-state and transient conditions. The
24 two recharge distributions, linear and
25 exponential, corresponding to the base and
26 alternative calibration models are shown in

1 Figure 3-5. The base-case calibrated average
2 recharge over the model domain is equivalent
3 to 28 percent of MAP in both scenarios and is
4 generally consistent with observed base flow
5 in Blairmore and Gold Creeks.

6 What are "steady-state conditions", Ms. Grainger?

7 A "Steady-state conditions" are basically one set of
8 conditions and then allowing the model to run to steady
9 state, if that -- hopefully that answers your question.

10 Q And what are "transient conditions"?

11 A Well, the "transient conditions" are inputting changes
12 during the model run. So those would be, for example,
13 the variation in base flow that's seen seasonally.

14 Q Well, let's look again to the figure that you drew my
15 attention to earlier, Figure 5 -- 3-5 at PDF page 215
16 of CR Number 3. This is the "Groundwater Recharge
17 Distributions", Figure 3-5.

18 Now, which is the base-case calibration model and
19 which is the alternate calibration model?

20 A I believe the base case is the linear model -- or
21 linear recharge distribution, and then the alternative
22 is the exponential.

23 Q And both the base-case calibration model and the
24 alternative -- alternate calibration model used an
25 average recharge of 28 percent of MAP; correct?

26 A Yes. That's what's stated in the report.

1 Q So let's just look at the recharge applied in the
2 middle reaches of Gold Creek.

3 MR. SECORD: And is it possible,
4 Zoom Master, to rotate the Figure 3-5 to the left?
5 And can we expand it a little bit? Beautiful.

6 Q MR. SECORD: So if we look at the figure
7 on the left, is that the base-case calibration,
8 Ms. Grainger.

9 A MS. GRAINGER: I believe so, yes. That's
10 linear distribution.

11 Q Right. And if we look at the area which comprises
12 Gold Creek, do you agree that the recharge that the
13 model is applying to that area is 450 to 550 millimetres
14 of recharge or, put another way, greater than
15 55 percent of the mean annual precipitation for that
16 catchment?

17 A Sorry. Can you remind me of the range that you were
18 specifying?

19 Q The yellow.

20 A Well, that's a portion of the area, but not the entire
21 catchment.

22 Q I'm just looking where Gold Creek -- where Gold Creek
23 runs through the base-case calibration model area. I
24 see that that area is covered, for the most part, with
25 yellow.

26 So do you agree that in -- certainly in the middle

1 reaches of Gold Creek, the recharge applied is between
2 450 and 500 millimetres or greater than 55 percent of
3 the mean annual precipitation?

4 A MR. HOUSTON: Can we just take a minute to
5 consult, Mr. Chair?

6 A MS. GRAINGER: Mr. Secord, I think we spoke
7 yesterday, but there's an area -- and I think that's
8 the -- the area that is particularly high -- that was a
9 clear-cut area. So recharge was increased by a factor
10 of 2 within that area because of the lower
11 evapotranspiration.

12 Q So the answer, then, Ms. Grainger, to my question is
13 that in the base-case calibration model, the recharge
14 applied to the middle reaches of Gold Creek is much
15 higher than 28 percent; it is in the range of 450 to
16 550 millilitres [sic] or greater than 55 percent of the
17 mean annual precipitation; is that correct?

18 A It is certainly higher in that area where it was deemed
19 appropriate to increase the recharge because of the
20 physical features, yes.

21 Q And certainly much higher than the numbers that are
22 listed in the Guan article that we looked at a moment
23 ago?

24 A Well, as I --

25 Q Well above the 38 percent number that was in the Guan
26 article; is that fair?

1 A Sorry. Which number in the Guan article?

2 Q Well, you said -- you said a moment ago, Well, we're
3 not doing too bad here, Benga; we -- we're within the
4 range. I mean, we're 28 percent. The range is less
5 than 1 to 38 percent.

6 So I'm just saying to you that in relation to the
7 base-case model used by SRK, they are using a recharge
8 of greater than 55 percent of the mean annual
9 precipitation. That's even outside the range that you
10 were noting earlier in my -- in response to that
11 question about the Guan article; correct?

12 A So the 28 percent is on average across the site. That
13 means there's areas that are lower and areas that are
14 higher. I'm not familiar enough with the Wilson and
15 Guan article to identify whether the ranges which are a
16 maximum of 38 percent in that article, whether that's
17 on the same basis of mean across an area or whether
18 that was actually the maximum applied. But as I -- I
19 noted previously, there are some concerns with the
20 applicability of that paper to the site.

21 Q Okay. Would you agree that SRK have applied -- SRK, in
22 its base-case calibration model, have applied too much
23 recharge that will lower the effects of -- on the
24 creek, specifically Gold Creek?

25 A So there's actually a sensitivity analysis with respect
26 to changes in recharge, and I think what's significant

1 about the sensitivity analysis is, yes, the model is
2 sensitive to recharge as a whole; however, the change
3 is the same. The effect of the project on recharge is
4 consistent percentage-wise regardless of the amount
5 of -- of recharge. So if you increase recharge
6 overall, there's still the same percentage change
7 produced by the project, and I think that's
8 significant.

9 Q Yeah.

10 MR. SECORD: Let's turn up that sensitivity
11 analysis. Table C-20 at PDF 295 of CR Number 3. And
12 it's at the bottom. And if you can maybe -- that's --
13 that's great. Maybe just a little less. There we go.

14 Q MR. SECORD: So this Table C-20 says,
15 "Relative Difference Percentage Long-Term Closure
16 Sensitivity Models to the Long-Term Closure Base-Case
17 Model"; correct? That's the title of the Table
18 2 dash --

19 A Yes, I think that's the title. Yeah.

20 Q Yeah. And do you agree that recharge is driving
21 everything in Table C-20?

22 A Well, I don't think it drives everything. I think
23 that's inaccurate. But we agree that recharge is -- is
24 significant in terms of base-flow outputs.

25 Q Can you please explain what the KR -- K/R ratio is in
26 Table C-20 and what purpose it serves?

1 A Sorry. Just a second. What -- K-and-R ratio is
2 increased. So that's both the conductivity and
3 recharge are changed proportionally.

4 Q And what purpose does it serve?

5 A Well, conductivity and recharge are related. It often
6 makes sense to test them in a related way because as
7 you increase recharge, in order to maintain flow -- or
8 heads within the groundwater table, usually you need to
9 modify conductivity as well.

10 Q Do you agree that 'K' is not really that dominant in
11 Table C-20 and that recharge is really the driving
12 factor?

13 A I've indicated that, yes, we're well aware that the
14 model sensitivity does identify that recharge is
15 significant in terms of the model outputs with respect
16 to base flow.

17 Q Now, I'm sure you or Mr. Jensen is aware that the SRK
18 model is already predicting a 10 to 20 percent
19 reduction in the base-flow contributions in seven out
20 of ten reaches assessed for Blairmore Creek and Gold
21 Creek? So you're aware of that? I mean, we can turn
22 up Table 3-6, if you want, but you're aware of that?

23 A Yes, I'm aware.

24 Q Okay. So using this sensitivity analysis, using -- so
25 if we go to reduction -- reducing the -- the recharge
26 by 50 percent -- so this is the third-last line of

1 Table C-20, sensitivity 'R' reduced by 50 percent, it
2 takes -- using 50 percent less recharge takes that
3 10 to 20 percent reduction down another 33 percent,
4 correct, for the Gold Creek reaches?

5 A No. That's -- that's incorrect. So this is a relative
6 percent difference that's identified in this table.

7 Q So what does that do -- so, for instance, on GC13, it's
8 36 percent; GC09, 33 percent; GC04, 34 percent; what
9 does that mean in terms of -- what effect, then, does
10 it have on the base flow contributions in seven out of
11 the ten reaches assessed?

12 A Well, as I said, I think what's significant about this
13 information is it shows a -- the similar effect if
14 recharge -- sorry. I'm not stating that very clearly,
15 but ...

16 The percent reduction base flow from pre-mining
17 levels doesn't change significantly in the sense that
18 we see the same change -- if recharge is increased
19 across the board and then we apply the -- the effect of
20 the project, we see a same change in base flow as we do
21 in -- in the base case -- or our -- our -- the
22 simulation that we've presented here.

23 Q So we've looked at the MAP for the entire Blairmore
24 catchment is estimated at 179 millimetres, and Gold
25 Creek is estimated at 77 -- 777 millimetres. And the
26 model, as we know, has used this average of 28 percent.

1 We see -- we've looked at that Figure 3-5, which shows
2 that in some -- in the middle reaches of Gold Creek,
3 the -- the recharge is greater than 55 percent of the
4 MAP. Can you tell me: How will this excess recharge
5 along the Gold Creek Valley influence the drawdown
6 extent calculated for the mine development?

7 A Sorry. I'm -- I'm unclear in your reference to "excess
8 recharge".

9 Q Yeah. So how will this excess recharge along the Gold
10 Creek Valley -- so the model isn't using an average of
11 28 percent; it's -- it's actually showing something
12 like 50 -- 55 percent of the MAP. How will this excess
13 recharge along the Gold Creek Valley influence the
14 drawdown extent calculated for the mine development?

15 A Sorry. I'm not -- I'm still not understanding your
16 question. I mean, the -- the --

17 Q Maybe -- maybe --

18 A Are you saying --

19 Q Maybe this question will be easier for you. Do you
20 agree that this excess recharge along the Gold Creek
21 Valley will make the drawdown extent calculated for the
22 mine development smaller?

23 A Yeah. I'm afraid I'm unclear about what you're
24 referring to with "excess recharge". So you're saying
25 that the -- the re -- you're implying the recharge used
26 in the model was too large? Is that --

1 Q Well, the SRK model, as I understand it, used an
2 average of 28 percent; correct?

3 A Correct, across the entire model area.

4 Q Right. So we know looking at the Figure 3-5 that, in
5 fact, in the middle reaches of Gold Creek the model is,
6 in fact, using recharge of 55 percent of the MAP;
7 correct? Or didn't you understand that from --

8 A Well, we haven't calculated what the average percent
9 MAP is for just the Gold Creek catchment.

10 Q Right.

11 A I think that's what you're referring to; right? And
12 you're suggesting that it would appear that it's
13 probably larger than 28 percent.

14 Q Well, we know it is, Ms. Grainger. There's no question
15 about that, is there?

16 A Well, I -- without having done the calculations, I'm --
17 I would reserve my opinion on that.

18 Q Well, how -- how --

19 A As I said, there are other areas where it's -- it's
20 lower, so if we look at the entire catchment --

21 Q But that's not my -- that's not my question,
22 Ms. Grainger. I'm talking about the Gold Creek Valley.
23 And I wouldn't think you'd have to do too much in the
24 way of calculation. You just have to look at the
25 shading and the colours, all of which are over
26 28 percent, all of which are over the average. So how

1 would this excess recharge along the Gold Creek Valley
2 influence the drawdown extent calculated for the mine
3 development?

4 A And I guess the issue I have is the reference to
5 "excess recharge". The reality is the -- the recharge
6 that was applied was used to calibrate the model or
7 the -- you know, the model was calibrated on recharge
8 to produce the base flow that it observed on Gold
9 Creek.

10 Q Do you agree that the 55 percent recharge applied to
11 the -- of the MAP applied to the middle reaches of the
12 Gold Creek Valley will make the drawdown extent
13 calculated for the mine development smaller?

14 A Well, the -- the recharge was increased in certain
15 areas in order that the model was able to reproduce
16 within an acceptable range the base flow that is
17 observed along Gold Creek.

18 Q Okay. Let's turn up table -- just before we break for
19 lunch, let's turn up Table 3-6 at PDF page 250 of CR
20 Number 3.

21 So this is the -- this is the monthly base-flow
22 reduction baseline to LTC.

23 And, first of all, Ms. Grainger, perhaps you can
24 help me with this. What is the significance of the
25 shading on Table 3-6?

26 A Sure. The shading was applied, in my understanding,

1 just to highlight for each location the highest period
2 of change.

3 Q So dark blue is the lowest change, and dark red is the
4 highest change?

5 A Sorry. That -- that's correct.

6 Q Okay. And so if we look, for instance, at --

7 MR. SECORD: Maybe we can just pull up very
8 briefly, Zoom Master, PDF page 80 and hydrology CR 4,
9 Figure 42. That's -- yeah.

10 Q MR. SECORD: So we'll just -- we're just
11 going to touch on this very briefly, but this is
12 Figure 42, the water quality prediction model, and this
13 shows stations GC13, GC10, GC4, and GC2 on Gold Creek;
14 correct?

15 A Correct, I see those there.

16 Q And do you know where GC09 is located?

17 A MR. HOUSTON: Sorry?

18 Q GC09.

19 A MS. GRAINGER: Mr. Secord, I'm just trying to
20 find another figure that would show those locations for
21 you.

22 Q Sure.

23 A So on CIAR 42, Consultant Report Number 3, PDF 184,
24 there's a figure, and it shows the Gold Creek stations
25 there. So you were looking for, I believe, GC09?

26 Q Yeah, GC09.

1 A Yeah. So it's at the top of the page there.

2 Q Just below GC -- GC -- just below GC --

3 A 13.

4 Q 13; right?

5 A Correct.

6 Q So if we could go back, then, to PDF 250.

7 So in this table, we see, for instance, for
8 Gold -- for Gold Creek, GC02, we see a 20 percent
9 reduction in May, a 19.3 reduction in June, an
10 18.6 reduction in July, a 17.9 reduction in August, and
11 a 17.4 reduction in September for that reach; correct?

12 A Yes, that's what's included in that table.

13 Q And this is basic -- this is, again, what the model has
14 generated for essentially the reductions to the base
15 flow or Gold Creek as a result of the mining operation;
16 correct?

17 A Correct, at the time of long-term closure, yes.

18 Q Right. And we've already heard from Mr. Houston that
19 in the months of September and October some reaches of
20 Gold Creek have run dry on the surface. You heard him
21 say that earlier today and yesterday; correct?

22 A Correct.

23 Q And then so if we look at September, if we look at the
24 reaches, GC13, 9, 4, 2, and 1, we see reductions of
25 11 percent -- 11.1, 11.5, 8.6, 17.4, and 6 point --
26 6.0 percent during those times of low flow; correct?

1 A That's the base-flow reduction at that time; correct.

2 Q Right. So then looking at your Table D-20, if you
3 reduce recharge by 50 percent, do you agree that it
4 will take these monthly base-flow numbers -- it will
5 reduce them down another 33 percent?

6 So maybe I can help you. Putting it another way,
7 SRK is already using 28 percent of the mean annual
8 precipitation for annual recharge. If you take the
9 28 percent down by 50 percent to a 14 percent annual
10 recharge, that then would result in a 36 percent to
11 33 percent reduction in the base flow in Gold Creek.

12 A So, Mr. Secord, my understanding of the data is that if
13 recharge was reduced by 50 percent, that across the
14 board -- and I -- it results in a reduction of
15 30 percent to these numbers or 35 as stated in the
16 table.

17 Q Okay. Well, let's go back to the table. This is C-20
18 at PDF 295 at the bottom. And what are you referring
19 to?

20 You're on mute. You're on mute.

21 A Sorry. If you change only recharge and reduce it by
22 50 percent, then you're applying those numbers, yes.

23 Q What numbers?

24 A The 30 -- the -- the numbers for GC13 of 36 percent, 33
25 percent, and so on.

26 Q Okay.

1 MR. SECORD: Mr. Chair, this would be a
2 good time to break for our lunch if that's agreeable.

3 THE CHAIR: Yeah. That's fine. So it's a
4 little after 12. We'll resume at 1 PM.

5 MR. SECORD: Thank you.

6 THE CHAIR: Thank you.

7 _____

8 PROCEEDINGS ADJOURNED UNTIL 1:00 PM

9 _____

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1 Proceedings Taken via Remote Video

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3 November 17, 2020 Afternoon Session

4

5 A. Bolton The Chair

6 D. O'Gorman Hearing Commissioner

7 H. Matthews Hearing Commissioner

8

9 M. LaCasse AER Counsel

10 B. Kapel Holden AER Counsel

11

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

14

15 T. Utting IAAC Staff

16 E. Arruda AER Staff

17 D. Campbell AER Staff

18 T. Turner AER Staff

19 T. Wheaton AER Staff

20 A. Shukalkina AER Staff

21

22 M. Ignasiak For Benga Mining Limited

23 C. Brinker

24

25 R. Warden For Ktunaxa Nation

26 T. Howard

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

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

1 R. Campbell For Coal Association of Canada
2
3 (No Counsel) For Alistair Des Moulins
4
5 (No Counsel) For David McIntyre
6
7 (No Counsel) For Fred Bradley
8
9 (No Counsel) For Gail Des Moulins
10
11 (No Counsel) For Ken Allred
12 (Not Present)
13
14 (No Counsel) For Monica Field
15
16 S. Frank For Oldman Watershed Council
17 A. Hurly
18
19 C. Longacre CSR(A) Official Court Reporter
20 _____
21 (PROCEEDINGS COMMENCED AT 12:59 PM)
22 THE CHAIR: Okay. Welcome back, everyone.
23 Mr. Secord, whenever you're ready, you can resume.
24 MR. IGNASIAK: He's just taking his dogs out,
25 Mr. Chair.
26 THE CHAIR: I see that.

1 MR. SECORD: I had to get rid of the dogs.

2 Sorry, sir.

3 THE CHAIR: No worries.

4 MR. SECORD: I have to say it's one of the
5 beauties of doing a Zoom hearing. You know, I -- I
6 have to say, I'm becoming a fan. I never thought I
7 would say that, but ...

8 GARY HOUSTON, DANE MCCOY, MIKE YOUL, MIKE BARTLETT,
9 CORY BETTLES, DAVID DEFOREST, SOREN JENSEN,
10 MARTIN DAVIES, LEIF BURGE, DAN BEWLEY, Previously
11 Affirmed

12 STEPHEN DAY, NANCY GRAINGER, Previously Sworn
13 Mr. Secord Cross-examines Benga Mining Limited

14 Q MR. SECORD: In any event, panel, if I --
15 if we could go to Mr. Houston's evidence about -- I
16 guess maybe we could pull up Exhibit CR 3, PDF
17 page 250.

18 MR. SECORD: Zoom Host, are you with us?
19 Thank you so much.

20 Q MR. SECORD: So, Mr. Houston, you mentioned
21 earlier that one of the reaches of Gold Creek had
22 essentially completely dried out in September of 2016.
23 And with reference to what the model predicts to be the
24 monthly base-flow reduction baseline to LTC, can you
25 tell me, in relation to what of these river reaches or
26 stations, that dry stretch was located nearest to, if

1 you could?

2 A MR. BETTLES: Mr. Secord, it's Cory Bettles.
3 I'll respond to your -- your question.

4 The -- the -- the -- there's two locations near
5 the town of -- the old historic town of Lille. The one
6 that's documented is kind of right in the vicinity of
7 the -- of the historic coal waste pile, kind of just
8 upstream of Morin Creek tributary. And then there's a
9 second one that is about -- about a kilometre just
10 upstream of that as well that goes -- that -- that does
11 go subsurface as well. And then more recently, as of
12 this -- the last -- I don't know -- several months,
13 we've actually documented a third location that does go
14 to ground and is fully disconnected up near the -- the
15 Gold Creek tributary GCT10 and 11.

16 Q Okay. So would that be -- so would that be between GC9
17 and C10?

18 A Mr. Chair, are you -- sorry. Mr. Secord, are you
19 referring to near the town of Lille, the -- the first
20 two examples I -- I shared?

21 Q So basically, Mr. Bettles, what I wanted to know is
22 these reaches that Mr. Houston had indicated that had
23 already dried up, which would -- which would be the
24 nearest GC stations that we see on Table 3-6?

25 A Okay. Let me just -- I'm trying to find a map to go
26 with that that --

1 Q Yeah. We --

2 A -- can be pulled up at the same time.

3 Q Yeah. We had that map.

4 A Can we -- can you -- can you share the map, and I can
5 tell you which ones? That would be better to show you
6 off -- I can point on the map exactly which -- that has
7 the -- I just don't have that up in here.

8 Q Ms. Grainger, I think, had the page number.

9 A MS. GRAINGER: Yes. It's PDF page 184.

10 A MR. BETTLES: Yes, please. Can we go to
11 184, please? And can we scroll down a little bit,
12 please? Thank you.

13 So if you -- if you look at the map, if you see
14 there is a -- a "GC2".

15 Q Yeah. That would be Lille.

16 A Yeah. That is -- that is --

17 Q That would be near Lille.

18 A Yeah, exactly.

19 So the -- the first example I provided you, that
20 is -- that is the documented location where we've
21 identified it going to ground.

22 Q And is -- is -- is that the -- is that the one you just
23 found this year?

24 A No, not -- that is not. This is the one we -- that
25 represents the photos from September of 2016.

26 Q Okay.

1 A And then there is another location about a kilometre
2 upstream of GC02, so quite close in proximity, but just
3 upstream of GC02 in that -- in that -- in that area
4 that does go to ground as well.

5 And then the one from this year that we have
6 located is upstream above Caudron Creek near -- it's in
7 the vicinity of GC09, but it'll be a little bit further
8 upstream, I believe, of GC09.

9 Q Okay. So back to -- back to Table 3-6. So if we look
10 at -- if we look at GC02, in September of -- in
11 September, the model -- the monthly base-flow reduction
12 baseline to long-term closure shows a 17.4 percent
13 reduction in the base flow at Gold Creek at that
14 station; correct, Ms. Grainger?

15 A MS. GRAINGER: Yes, that's correct.

16 Q And this, of course, as we know, is based on SRK using
17 an average of 28 percent of the MAP for recharge. And
18 so based on our discussion just before lunch, using the
19 sensitivity analysis, if you apply a 33 percent
20 decrease on top of that, then you would see a --
21 basically a reduced flow of 24 percent at GC02 based on
22 the Table G- -- C-20, "Sensitivity Analysis"; correct?

23 A I think it is important to understand that the model is
24 developed and calibrated, and then the sensitivity
25 analysis is completed. And the sensitivity analysis is
26 completed by just changing one or two parameters as

1 have been described in the modelling report. So the
2 model is technically not calibrated at that point to
3 fully represent the system with that kind of recharge.
4 So it's a guide. It gives us -- the value of the
5 sensitivity analysis is it helps us to understand which
6 parameters do have a significant influence on the model
7 output. So certainly recharge, we understand,
8 definitely has an effect on the model predictions.

9 However, we can't strictly take those numbers and
10 then just apply them because to recalibrate the model
11 and have it represent the hydraulic heads and the
12 base-flow measurements that were observed within the
13 project area, we would have to change other parameters
14 as well in the model.

15 Q Well, I think you're -- I don't think you're right,
16 Ms. Grainger. If we could go back to Table C-20,
17 PDF page 295. And I think you've already given this
18 evidence. Let's just go to the bottom.

19 So we have there GC02, which -- where we know --
20 where we already know that in 2016, that stretch of the
21 Gold Creek had run dry, as we've seen in the
22 photographs. So what this table shows that by -- by
23 changing the model, which SRK used a 28 percent average
24 annual recharge number, by reducing that to 14 percent,
25 which Dr. Fennell says may still be too high, we see
26 that for GC02, there will be a 33 percent reduction in

1 the flow at GC02. That's what it's -- that's what it
2 states in the third line from the bottom in Table C-20;
3 correct?

4 A MR. HOUSTON: Mr. Secord, Mr. Chair,
5 Ms. Grainger has been pretty clear here as the
6 expert --

7 Q I -- I --

8 A -- related to these tables.

9 MR. SECORD: You know, I think, Mr. Chair,
10 I'm going to ask for a ruling that Ms. Grainger answer
11 the -- answer the question.

12 A MR. HOUSTON: And I'm just going to point
13 out she --

14 MR. SECORD: I'm --

15 A MR. HOUSTON: -- already has, Mr. --

16 THE CHAIR: Mr. Houston.

17 A MR. HOUSTON: Yes. Okay.

18 THE CHAIR: Let Ms. Grainger answer, and
19 if you want to supplement, you may.

20 A MS. GRAINGER: I believe your question,
21 Mr. Secord, was that the -- the reduction of recharge
22 by 50 percent when we only change that value in the
23 model results in a 33 percent reduction of base flow at
24 GC02.

25 Q MR. SECORD: So --

26 A My caution on applying that directly was that -- just

1 to highlight that you are only changing one
2 characteristic of a calibrated model which then renders
3 the model no longer calibrated.

4 Q Sure. And I guess we can talk about whether the model
5 was properly calibrated, and that's, you know,
6 something obviously that Dr. Fennell will speak to.

7 But in terms of the actual reduction when we
8 look -- turn to Table 3-6 for GC02, you would agree
9 with me that by reducing the annual recharge from
10 28 percent to 14 percent, that would result, then, in a
11 reduced flow at GC02, in September, of 24 percent;
12 correct?

13 A That's -- that's not the intention of -- I think we're
14 extending this analysis beyond its -- its useful
15 purpose. So it highlights that certainly recharge is
16 a -- a significant parameter in the model and does
17 result in changes to base flow. I think to take this
18 number and apply it to that table is incorrect.

19 Q That's what Table D-20 is doing, is it not? It's
20 applying the -- it's applying that sensitivity analysis
21 to all of the stations in the Gold Creek -- along
22 Gold Creek that are listed there, correct, such as
23 GC02?

24 A It's comparing the model output at each of these
25 locations and calculating a relative percent difference
26 in order that we can understand what the effect is of

1 changing these parameters by the amounts indicated.
2 That is the intent of this table.

3 Q Right. All right.

4 MR. SECORD: So if we could then turn up
5 Dr. Fennell's errata sheet, CIAR Number 844. And if
6 you could scroll down to Point Number 3.

7 Q MR. SECORD: So, Ms. Grainger, Dr. Fennell
8 wrote in his report -- and I'm just going to read the
9 first sentence so we don't have to jump back and forth,
10 but this is at PDF page 78 of the Coalition evidence.
11 And he writes: (as read)

12 The SRK groundwater numerical model projects
13 that drawdown effects will be limited to
14 within 400 metres of the mine pit extent,
15 Figure 3, left image.

16 And then this is the errata. He goes on to say:
17 (as read)

18 This is a difficult conclusion to align with,
19 considering the concerns related to the model
20 configuration and results of empirical
21 formula calculations indicating impact
22 distances anywhere from about 860 metres up
23 to 1,880 metres over a 50-year time span
24 using a k-value consistent with the geometric
25 mean readings reported for the Mist Mountain
26 Formation; i.e., 1.1 times 10^{-7} M/S.

1 So he then says: (as read)

2 To correct for the expected increase in
3 hydraulic conductivity following the removal
4 of 430 metres of overlying mountain, a value
5 of 3.1 times 10^{-7} M/S was calculated using the
6 depth relationship employed by SRK at page
7 38, along with an effective porosity of 5
8 percent to emulate fracture porosity and
9 40 metres of sustained drawdown from the mine
10 pit.

11 So Dr. Fennell estimates -- estimates of the extent of
12 the drawdown from the pit boundary using analytical
13 equations indicate a much larger area of influence up
14 to 1,880 metres over 50 years. How do you explain this
15 discrepancy from the 400 metres projected by the SRK
16 groundwater model?

17 A MR. HOUSTON: Mr. Chair, it seems to me that
18 Dr. Fennell should be speaking to his work. I -- I
19 don't -- I don't understand why we're being asked to
20 speak to Dr. Fennell's evidence here.

21 Q I guess my question, Ms. Grainger, is: Why is only
22 400 metres being projected by the SRK groundwater
23 model, whereas Dr. Fennell suggests that the impact
24 distances could be anywhere from 860 to 1,880 metres?
25 And I guess as a further question: Have you looked at
26 this issue? I think in his initial report -- in his

1 initial report, I think he used the figure 1,500
2 metres, and I'm just wondering whether you've examined
3 this at all?

4 A Again, Mr. Chairman, I don't think it's up to us to
5 discuss Dr. Fennell's findings. That -- that should be
6 something he defends when he's giving his own direct
7 evidence. It's difficult for us to understand exactly
8 what he's done and why he's done it.

9 Q Yeah. Well, Mr. Houston, are you a hydrogeologist?

10 A No. I'm -- I'm -- I'm the policy --

11 Q So -- so --

12 A -- witness. Yeah. So I'm -- I'm --

13 Q So I -- so I --

14 A I'm saying --

15 Q So I --

16 A I don't think we should be -- yeah. I don't think we
17 should be defending Dr. Fennell's calculations. That's
18 all.

19 Q No. No.

20 MR. IGNASIAK: Mr. Chair, I think the
21 question can be rephrased to ask Ms. Grainger about her
22 work in this area, but I would agree that asking her to
23 interpret why Dr. Fennell's done something is -- it's
24 not something she should be expected to testify to.

25 THE CHAIR: Okay. Mr. Secord?

26 MR. SECORD: Right.

1 Q MR. SECORD: Well, in Mr. -- in
2 Dr. Fennell's initial report, he indicated that he
3 thought there would be an impact distance of
4 anywhere -- of up to 1,500 metres. He's since
5 suggested that.

6 Ms. Grainger, have you done any work in this area
7 to determine whether this 400 metres projected by SRK
8 in its model may be understated?

9 A MS. GRAINGER: Well, I don't -- excuse me. I
10 don't believe it's understated. I -- I believe it's
11 the right order of magnitude, and the -- the reason
12 that I think some interpretations might expect a larger
13 area drawdown is a -- a simple calculation which looks
14 at, essentially, a flat-line structure. And so
15 drawdown propagates that outwards, kind of like a dish
16 or a bowl, if you will, in a very simplistic way.

17 What we have to remember is that the structure of
18 the units that we have has essentially tilted that on
19 an angle at the project site, and therefore, the
20 drawdown extends over a much smaller area than it would
21 if it was in a -- a flatter setting, let's say.

22 And I have seen this in my experience working at
23 prairie coal mines as compared to mountain coal mines.
24 So we do see larger drawdown cones associated with
25 prairie coal mines, where they have flatter structure
26 of the geology. In mountain coal mines, the drawdown

1 is usually much tighter and doesn't extend as far.

2 Q And why does the tilt cause the area of impact to be
3 less?

4 A Because of the contrast in conductivities. You've got
5 different units one on top of another, and they all
6 have different conductivities. Some are higher, and
7 some are lower. But the net result is that it's
8 difficult for the -- or for the drawdown to transmit
9 from one unit to the next. As soon as it encounters a
10 unit of lower permeability, it transmits much more
11 slowly.

12 So the result is that the drawdown extends
13 laterally within a unit, and because of the structure,
14 as I've indicated, that's tilted on an angle that
15 extends within the bed that is on an angle, and so in a
16 map view, that's a very small distance.

17 Q And what angle is it tilted at in this case?

18 A I'll have to look up that number, if you require that.
19 But we've shown it on our cross-sections in Consultant
20 Report Number 3. I can refer to those.

21 Q And what about the faults of the fractures? How do
22 they affect the projected distance in this tilted
23 environment?

24 A Yeah. So CIAR 42, Consultant Report Number 3, there's
25 a series of cross-sections starting on PDF 79.

26 Yeah. Sorry. We may have -- I don't know if we

1 can rotate it. But that shows -- I believe there's a
2 vertical exaggeration applied to the figure so the dip
3 of the units can't be directly measured, but it does
4 illustrate the dipping nature of the bedrock units, and
5 then there's a fault also illustrated on this feature,
6 on this cross-section.

7 Q And where is the fault indicated?

8 A So you can see -- if you follow the Seam Number 4 shown
9 in red, and you can actually see the displacement on
10 Seam Number 4. If you follow it from the left-hand
11 side, you can see that it -- it -- it goes up towards a
12 fault; it terminates because the fault has then
13 displaced both sides of the -- the fault block. So the
14 side -- the rocks on the left-hand side have been moved
15 upwards relative to the rocks on the left-hand side --
16 or the right-hand side, sorry, to the east.

17 Q All right. Let's turn to PDF page 194, Table 2-5 of CR
18 3. And we'll take a look at some of these hydro --
19 hydraulic conductivity values that you were talking
20 about a moment ago.

21 Just could we go back to that figure that you were
22 just looking at for a minute?

23 Ms. Grainger, does that show west-to-east faults?

24 A Those faults would -- the strike of the fault is
25 north-south.

26 Q Okay. All right. Back to PDF page 194. So would you

1 agree that most of the hydraulic conductivity k-values
2 used to constrain the groundwater model have focused on
3 coal-bearing rocks?

4 A Yes, that's correct. We've stated that most of our
5 testing focused on the coal-bearing rocks.

6 Q And this leaves many of the other formations, including
7 those below the mine footprint, as unknown or
8 unassessed?

9 A They're not completely unassessed, but there's limited
10 data for the other units. Part of the reason we
11 focused on the coal-bearing -- or the coal seams
12 themselves is 'cause frequently they are the more
13 permeable units within the sequence.

14 Q And what is a "slug test type"?

15 A A "slug test" is a test that's completed in a
16 monitoring well where you create an instantaneous
17 displacement of the water level, and then you measure
18 the water level as it responds within that well, and
19 then there are analyses that you conduct to -- you
20 analyze that data to give you an assessment of the
21 conductivity. So it's measuring horizontal
22 conductivity.

23 Q All right. So if we go to page PDF 209, the first
24 bullet of CR 3. And this is under "Model Properties"
25 at the bottom -- sorry. The first bullet on page --
26 yeah, the first bullet on page 209. So it talks about:

1 (as read)

2 Hydraulic conductivities 'K' in bedrock
3 parallel to bedding range between 6 times 10
4 to the 10 to 1.7 times 10 to the -- to the
5 minus 7.

6 Table 3-1. K-values are constant within
7 a given layer. This hydraulic testing
8 generally targeted coal seams. The 'K' of
9 the host rock is not completely
10 characterized.

11 So does that go back to that earlier -- your earlier
12 remark that basically many of the other formations,
13 including those below the mine footprint, are basically
14 unknown or unassessed for the most part?

15 A We have less data on them. The table that we were
16 looking at just before -- I don't know if we can return
17 to that, but there are packer tests in that table also,
18 and the packer tests are completed over larger
19 intervals within the core holes. So I believe the
20 longest interval was 116 metres.

21 Q Yeah.

22 A And the nature of --

23 MR. SECORD: So we could scroll down, and,
24 Zoom Host, maybe you could just maybe reduce it to --
25 there we go.

26 Q MR. SECORD: So we see the packer tests in

1 RGSC-004, for instance?

2 A MS. GRAINGER: Correct, and then -- and then
3 further down.

4 So they just show the interval that was
5 essentially used for the test, so the top and the
6 bottom. And so they're over larger intervals. So
7 although they reference the coal seam, they also
8 include significant portions of the other units. So
9 it's not perfect, but it does mean that substantially
10 larger portions of the material were tested than just
11 the coal seams themselves.

12 And the nature of these tests is that we get a
13 response from the most conductive unit that is tested.
14 So the lower permeability units would not essentially
15 respond because they're too slow within the scale of
16 the test. So these tend to give us a higher rather
17 than a lower bound on the conductivity of the material
18 that's tested.

19 Q Looking at that first bullet from PDF page 209. What
20 is the host rock? What does it consist of in the
21 project area?

22 A So the Mist Mountain Formation, which is the main unit,
23 it's a -- a sequence of sandstone, mudstone, siltstone,
24 shale, and then coal.

25 Q Okay. So regardless, k-values are given to the various
26 nine layers of the groundwater model.

1 So if we could turn to PDF page 211 of CR
2 Number 3.

3 So you'll see here you've got the linear recharge
4 that would be the baseline model conditions; is that
5 right?

6 A These are the calibrated conductivity values that were
7 used in the model. So they reflect, after calibration,
8 what the conductivities are in each of the units.

9 Q And the one below is the exponential recharge; correct?

10 A That's correct.

11 Q So regardless, as I say, k-values are given to the
12 various nine layers in the SRK groundwater model. How
13 can the JRP be confident that the model is accurately
14 reflecting the transmissive capabilities of the rocks
15 when there is little local information to describe the
16 host rocks?

17 A Well, as I've indicated, the conductivity not -- test
18 results not only come from discrete testing of the coal
19 seams themselves but also from these longer intervals
20 of testing. Conductivities would've been entered into
21 the model, and then it was calibrated such that the
22 model matches the hydraulic head observations that we
23 have in the monitoring wells and the vibrating wire
24 piezometers as well as the base-flow measurements.

25 Q So can you -- let's just take a look at Table 3-1, the
26 "Calibrated Hydraulic Conductivity Value by Model

1 Layer". How were these first three numbers selected
2 for K1, K2, and K3?

3 A So there's a process of calibration, which is described
4 in the model report. So there's a systematic way in
5 which the values are modified. So there would've been
6 some values close to these, presumably, that was input
7 into the model initially, and then they would do a
8 series of iterations of runs. So if we go to page 216
9 in the PDF, it describes the model calibration process.

10 Q Let's go to --

11 A Does that answer your question?

12 Q No.

13 MR. SECORD: Let's go to page 209. And if
14 we -- can you -- can you make it -- there we go. Keep
15 going. Yes. This is the -- at the bottom of the page.

16 Q MR. SECORD: It says here: (as read)

17 Table 3-1 and Figure 3.3 present the site 'K'
18 data together with calibrated model k-values.
19 Note that the values for the fractured
20 bedrock incorporate the hydraulic barrier
21 effects of the thrust faults in the K2 value
22 which otherwise would be similar to K1.

23 So if we go back to Table 3-1 on PDF -- on PDF 211, is
24 this saying, then, that for the first layer, the K2
25 value would be similar to K1 but for the hydraulic
26 barrier effects of the thrust faults? Is that -- is

1 that correct?

2 A MS. GRAINGER: Yes. There's a -- generally
3 about a half order of magnitude difference between K1
4 and K2; the lower one being in the east-west direction;
5 the higher conductivity being in the north-south
6 direction.

7 Q Okay. And so if we go back to Table -- to Table 2-5 at
8 PDF page 194, we see the -- we see various k-values
9 calculated for various monitoring wells; correct?

10 A Correct. These are the site data that was determined,
11 yes, from the slug tests and the packer tests.

12 Q Right. So are numbers from the actual summary of the
13 'K' tests -- do they find themselves -- do -- are they
14 allocated in some fashion to the figure on PDF page 211?

15 A So -- yes. As -- so there's several -- that's --
16 essentially what's described on 209 is there's a -- a
17 set of assumptions that were used to order the
18 variations in -- in conductivity. So one of them
19 was -- as we've talked about, the K1 and K2 vary by
20 about a half order of magnitude, and those are both
21 higher than K3, so that's consistent within each layer.
22 You can see that there's -- typically K3 is two orders
23 of magnitude lower than K2, and then there's a half
24 order of magnitude difference between K1 and K2.

25 In addition, as was outlined on page 209, it talks
26 about conductivity decreasing, and there's an -- an

1 equation that was used to reduce it by depth.

2 Q Okay.

3 A So we go from Layer 1 to Layer 2. Layer 2 has lower
4 conductivity overall than Layer 1.

5 Q Okay. So can you tell me: What was the justification
6 for selecting $2.7E-07$ for Layer 1 for K_1 ? I'd like to
7 just go over that first row and just understand what
8 was the rationale and -- you know, given the limited
9 number of 'K' tests that we see, you know, in that
10 summary of 'K' tests -- and there really aren't very
11 many monitoring well tests. Most of them are in coal.
12 I'm just wondering: What was the -- you know, why was
13 that number selected? What was the rationale? What's
14 the backup? Is there averaging? I'm just trying to
15 understand how you -- obviously you didn't do this, but
16 how did SRK pick these first three numbers for Layer 1?

17 A So these are not the numbers they would've picked. So,
18 for example, they would've, as I described, set up
19 initial values on that basis of using the relationships
20 between K_1 and K_2 and K_3 and the different layers.
21 They would've input those into the model and run the
22 model, and then they would've began a systematic
23 process through calibration of varying certain
24 parameters at a time in order to replicate the
25 hydraulic head measurements at all of the -- the
26 monitoring wells and the vibrating wire piezometers,

1 and then also to replicate, as best as they could have
2 the model do, the base-flow observations.

3 So it's -- it's an iterative and lengthy process,
4 and the values that we see here is the final calibrated
5 model -- in this case for the linear recharge
6 scenario -- that best fits all of the data that we
7 have, the hydraulic heads and the base-flow
8 measurements.

9 Q So the first layer is 40 metres, correct --

10 A That's correct.

11 Q -- each of these --

12 And if we look at Table 2-5, the summary of 'K'
13 tests that's on page -- there we go. So if we look
14 here at the screened intervals, would I -- would it be
15 correct that Monitoring Well 15-12-7 would be in that
16 first layer?

17 A So these are not applied in that manner. We can talk
18 about surficial deposits, the first one, because the
19 surficial deposits are not explicitly included into the
20 model. But it's not a matter of taking by depth the
21 physical measurements and then applying them to
22 the layer that corresponds to that depth. The
23 full data set was looked at on a -- a -- a
24 conductivity-versus-depth basis, and that was the
25 relationship that was then applied to the model.

26 Q Well, Table 2-5 is the full data set. This is the

1 summary of 'K' tests that were conducted for the model;
2 correct?

3 A This is the conductivity tests that were completed as
4 part of the study.

5 Q This is all of them? This is all of the 'K' tests that
6 were performed for the purpose of SRK constructing its
7 model?

8 A Well, that were -- yes, it's all of the available
9 conductivity data.

10 Q Right. And so for the first layer, as I look at this,
11 the only data that you have for the first layer of the
12 model would be the first four well ID numbers here?
13 Once you get into the Mist Mountain Formation, you're
14 below -- 40 metres below ground surface; correct?

15 A Sorry. It -- it varies depending on location. We can
16 see -- oh, sorry. MW1406-32, for example, is in the
17 Mist Mountain Formation and is at a depth that's
18 shallower than 40 metres.

19 Q Sure. But there's not a lot in that first 40-metre --
20 that first 40-metre interval. So, again, I'm just
21 trying to understand. When I look at these 'K' numbers
22 in Table 2-5, I just don't see how you get from those
23 numbers to Table 3-1 and these calibrated hydraulic
24 conductivity values for the first layer. That's, I
25 guess -- just wondering whether you can help me with
26 that, if there's any correlation between what was

1 actually recorded and what SRK used in its model?

2 A Well, I would say that all of this information was
3 used, and it was pooled. It's just not used directly
4 as in, We measured this value, at this depth, at this
5 location, and so, therefore, it's directly applied into
6 the model in -- in the same manner. It's -- it's
7 pooled -- there was a -- an interpretation made of
8 depth relationship to conductivity, and that's what was
9 applied into the model. So the -- resulting -- I think
10 if you review these conductivity results with those
11 that were applied in the model, the ranges are
12 consistent.

13 Q If we could turn up, please, PDF page 55 of CR 3.

14 Just while we're pulling that up, Ms. Grainger,
15 just one question about the model. Benga's removing
16 the coal, so how are the k-values in the coal relevant
17 to the model?

18 A Would you like me to answer that question right away,
19 Mr. Secord?

20 Q Sure. Sure.

21 A Sure. So the -- I mean, the pit is being advanced into
22 the coal, and so, therefore, those units are the ones
23 that we are most interested in because that is where
24 the pit is being developed and -- and where drawdown is
25 being propagated from.

26 Q Okay. If we could scroll down, please, to the second

1 paragraph under "Assessment Results". So this
2 paragraph starts: (as read)

3 Groundwater residence time, travel time to
4 the creeks from the LTC scenario is predicted
5 to be mostly greater than ten years.

6 Then the part that I'm interested is in the next
7 sentence: (as read)

8 The groundwater modelled with the longest
9 residence time, greater than 50 years, is
10 close to the topographic highs, and the
11 shortest, less than 20 years, are close to
12 the topographic lows.

13 And in terms of the -- you understand what the "LTC"
14 definition is, Ms. Grainger?

15 A "Long-term closure", yes.

16 Q Right. It's representing the completed open pit with
17 in-pit backfilling, saturated rock fill, and open-pit
18 lake, and a reclaimed surface water management system?

19 A Correct.

20 Q That's the -- yeah.

21 If we could please turn up PDF page 112 of CR
22 Number 3. And this is the Table 5.3-9, "Predicted
23 Groundwater Travel Time to Creek Discharge for LTC".
24 And if we go to the legend below, there is a heading
25 "Mean Lifetime Expectancy Per Year"; correct,
26 Ms. Grainger?

1 A That's correct.

2 Q And the green is the 50 to 100, and then we have a lime
3 green at 20 to 50, and yellow from 10 to 20?

4 A That's correct.

5 Q Could you please explain what is meant -- what is meant
6 by "mean life expectancy" using your terminology or
7 Millennium's terminology?

8 A Well, the travel time represents the time it would take
9 for water at the location that's shown -- groundwater
10 at the location that it's shown to migrate to the
11 nearest creek following the groundwater flow pathways.
12 So obviously closer to the creeks, travel time is
13 short, and as we get more distant from the creeks, then
14 travel time is much longer.

15 Q Okay. So the residence time or mean life expectancy,
16 to use your terminology, that's one and the same?

17 A Yeah. I just -- you referred to it as the "travel
18 time", but ...

19 Q Okay. So maybe I'll just use that, then. The travel
20 time of groundwater is stated as being in excess of
21 50 years over most of the model domain represented by
22 the turquoise colour?

23 MR. SECORD: So we go -- maybe we can
24 reduce that to -- maybe to 50 percent. Let's reduce it
25 to 50 percent. There we go. Maybe even 20 -- yeah.
26 Perfect.

1 Q MR. SECORD: So would you agree that the
2 travel time of groundwater is stated as being in excess
3 of 50 years over most of the model domain represented
4 by the turquoise colour?

5 A I believe that's what we read just before in the -- in
6 the paragraph previously, correct.

7 Q And with values of less than 20 years in the valley
8 bottoms?

9 A Yeah, the --

10 Q That would be -- that -- that would be represented by
11 the yellow colour?

12 A Yes, the yellow colour would represent 10- to 20-year
13 travel time.

14 Q Right. So less than 20 would be the yellow; right?

15 A Or red, yes.

16 Q Right. Okay.

17 Now, the ponds on the east side of the mine
18 footprint, the NESP and the ESP near Fran Gilmar and
19 the SESP located south of Fran Gilmar and, I guess, to
20 the west of the Donkersgoeds, are located in some of
21 the areas where transit times are listed as zero to
22 ten years; is that correct?

23 A Yes, I think that's correct.

24 Q And so is it going to be -- are we talking zero years
25 or one year or nine years or ...

26 A Well, it's -- it's a range. So obviously if it's, you

1 know, in the red zone but close to the yellow boundary,
2 then it would be closer to ten years. And if it's
3 closer to the creek, then it's -- it's some number less
4 than that, but it's a range within that area, and it --
5 it varies linearly; right? So ...

6 Q So where the travel times are listed as zero to ten
7 years, does that lead to concerns that seepage of
8 contaminants to Gold Creek will occur?

9 A Well, I believe we were talking about the sedimentation
10 ponds which we've talked about this morning in that
11 there aren't any concerns with respect to the water
12 quality from the sedimentation ponds.

13 Q But these red areas encompass more than the NESP, ESPs,
14 and SESP; correct? These red areas are far more --
15 cover far more territory than those structures?

16 A MR. HOUSTON: Mr. Chair, can we just take a
17 minute to have a discussion here?

18 Apologies, Mr. Secord. Could you repeat the
19 question -- the last question?

20 Q Okay. We can see in the -- in this figure the areas
21 where the travel times are zero to ten years. The
22 areas that are sitting in red, let's say in the area
23 where the ESP and SESP were located, is the -- is the
24 travel time zero years, or is it ten years?

25 A MS. GRAINGER: It's somewhere between those
26 two values. So, I mean, the -- this map is not

1 intended to show precisely at every location what the
2 travel time is. It's intended to give an indication of
3 the areas where it is short, as you pointed out, and --
4 and other areas where it is much longer under the
5 long-term closure conditions.

6 Q Okay. And where you have these travel times listed as
7 zero to ten years, does that lead to concerns that
8 seepage of contaminants to Gold Creek will occur from
9 the mine site area shaded with these short travel time
10 [sic]?

11 A Well, it was part of the evaluation, so our assessment
12 looked specifically at where there could be sources.
13 So, for example, the rock disposal areas, which is the
14 section that we were reading from previously that you
15 quoted, that was specifically looking at concerns
16 related to the rock disposal areas and where those are
17 located and what the travel time is from those areas
18 towards the creek. With respect to the sedimentation
19 ponds, there isn't a concern with respect to
20 contamination, particularly under the long-term closure
21 scenario, so ...

22 Q And this is the -- this is the long-term disposal --
23 the long-term closure scenario here in Figure 5.3-9;
24 correct?

25 A Yes.

26 Q This is showing -- this is showing what the travel

1 times will be at long-term closure?

2 A Correct. I think we should understand too -- and I --
3 I just looked, and I can't see it in the modelling
4 report, but we've only produced this map for long-term
5 closure, not under baseline conditions. But I would
6 expect quite a large portion of the areas, in fact,
7 unchanged between current conditions and the long-term
8 closure.

9 Q Okay. Now, do you agree that hydraulic conductivity
10 testing of monitoring wells only provides an idea of
11 the transmissive properties of the soil or rock in a
12 very small area around the monitoring well?

13 A Yes, that's accurate.

14 Q Do you agree that the accuracy of k-values is very
15 important when modelling the effects of drawdown and
16 residence or travel times?

17 A Conductivity is certainly an important parameter in a
18 numerical model.

19 Q Do you agree that when longer term pumping tests are
20 conducted, the k-values obtained are often higher,
21 sometimes by an order of magnitude?

22 A Yes. That presumes that you were able to conduct
23 pumping tests. As we've seen, a lot of the
24 conductivities in the rocks here at the site are --
25 are -- and low, and therefore, pumping tests would just
26 be impractical, unfortunately.

1 Q Is it correct that Benga did not do any pumping tests
2 to better constrain the k-values used in the SRK
3 groundwater numerical model?

4 A There was one pumping test that was completed from a
5 flowing core hole that gave us some information, but as
6 I've indicated in general, it was -- it was just not
7 simply possible to do pumping tests in lower
8 permeability rocks.

9 Q Was it attempted? Did Millennium attempt to do any
10 pump -- any other -- any other pumping tests other than
11 the one that was done?

12 A Since the application was submitted, we have undertaken
13 some limited pumping tests, which don't change our --
14 our understanding of the conductivity of the materials
15 on the property in any substantive way.

16 Q Okay. And was that data given to SRK?

17 A No. This was work that was undertaken subsequent to
18 the model being completed, but as I said, it -- it
19 doesn't change our interpretation of the conductivity
20 of the materials on the site.

21 Q Okay. So going back to PDF page 55 of CR Number 3, I
22 had read you the passage about travel times being
23 greater than 50 years and less than 50 years. It's the
24 next sentence I want to focus on: (as read)

25 Therefore, most basal leakage from the waste
26 rock dumps would reside in the groundwater

1 system for a duration that substantially
2 exceeds the critical residence time to
3 attenuate any selenium.

4 A Yes. I see that there.

5 Q What is the justification for this statement given that
6 no transport and fate modelling was done?

7 A The justification was based on observations from the
8 site. We collected data at water that was emanating
9 from historical mining, like old rock piles and so on,
10 which did not contain elevated concentrations of
11 selenium, and from information from other sites. So
12 that's summarized in the preceding text.

13 Q And how does this statement in this sentence apply to
14 other constituents, such as arsenic, chromium, mercury,
15 or cobalt that might be mobilized?

16 A Well, in general, I mean, fundamentally, those weren't
17 specifically looked at within the assessment, as there
18 weren't concerns identified with those parameters
19 specifically, but metals frequently do absorb -- absorb
20 to particles during transport and can be attenuated in
21 a very general sense.

22 Q Now, Benga indicates that the dominant pathways for
23 groundwater flow in the project area are faults and
24 fractures in the rock; correct?

25 A Correct. That is our understanding.

26 Q What work did Benga do to map or better understand

1 these important features in the area of the proposed
2 mine as well as areas beneath the solid and liquid
3 waste management areas?

4 A So we looked this morning at the significant thrust
5 faults that have been mapped at the project site.
6 We've also talked this morning in regards to additional
7 work that would be done in specific areas as needed in
8 order to better characterize the underlying rock.

9 Q Did Benga do any lineament mapping, fracture
10 orientation assessments, or borehole televiewer
11 surveys?

12 A MR. HOUSTON: Just give us a minute,
13 Mr. Chair. We'll -- we'll ...

14 A MS. GRAINGER: Mr. Secord, to the best of my
15 knowledge, those analyses were not completed at this
16 time.

17 Q Did Benga do any pumping tests and monitoring of
18 bedrock wells to determine if there was evidence of
19 hydraulic connectivity between the areas where the
20 waste solids and liquids will be stored, and local
21 water features?

22 A So as I mentioned just previously, there was one
23 pumping test that was completed; however, it was not
24 for that purpose.

25 Q So why not, then?

26 A Well, I think, as we've talked about also, the

1 conductivities are generally low, and pumping tests
2 are -- are not practical in rocks that have these lower
3 conductivities.

4 Q Okay. So Benga indicates that if faults are
5 encountered that present a risk as acting as pathways
6 for groundwater flow and contaminant movement, the
7 mitigation will be to seal them off. Do you agree that
8 visual identification of faults in the mine workings
9 will not likely be possible due to the obscuring by
10 residual fines and rock fragments?

11 A Mr. Secord, I'd have to look up the reference, but
12 there is a -- a response to a -- an information request
13 where we did provide some additional information that
14 discussed geophysical techniques and overhead imaging
15 techniques and other approaches to identify and map the
16 orientations of fractures at the site in -- in areas
17 such as the mine specifically and also at the rock
18 disposal areas.

19 Q So similarly, do you agree that on the outside of the
20 mine footprint, rock dumps and water management ponds
21 will be established in areas covered by soil, also
22 obscuring any faults present?

23 A MR. HOUSTON: Maybe I could take that one,
24 Mr. Secord --

25 Q Sure.

26 A -- if you don't mind.

1 Q And take -- and take -- take the one before as well,
2 Mr. Houston.

3 A Sure. Sure. Sure. So before we develop the ex-pit
4 rock dumps, we're going to strip all of the topsoil and
5 the trees, and -- and we will do additional
6 investigation to, as -- as Ms. Grainger pointed out, to
7 more -- more precisely map out any -- any fault
8 structures in -- underneath those areas. So that --
9 that work will all be done as part of the mine
10 development.

11 Q So back to Ms. Grainger. Do you agree that the
12 placement of any monitoring well could very well miss
13 these obscured features?

14 A MS. GRAINGER: Well, that is part of the
15 intent of doing the analysis and it would be considered
16 in the monitoring well placement. We've also talked in
17 some of our IR responses about some of the different
18 approaches we can use during monitoring well
19 installation in order to identify fracture zones within
20 a -- a borehole and target those for monitoring.

21 Q How will Benga ensure that all faults and fractures are
22 identified and monitored accordingly so that no
23 contaminants bypass the surveillance system and reach
24 Blairmore and Gold Creeks?

25 A Well, I -- I -- I think it would be impractical to
26 monitor all faults and fractures; however, the intent

1 would be to monitor downgradient immediately in the
2 area of the rock disposal areas, for example, and to
3 collect information there at a representative number of
4 locations and also to monitor upstream of the
5 receptors. And, again, we've -- we've provided
6 additional detail and description of the monitoring
7 plans.

8 Q Okay. And in relation to the -- the ESP, what --
9 what -- what would be downgradient of the ESP? Where
10 would that monitoring well go, Ms. Grainger?

11 A I might just need a minute or two to pull up a map, if
12 that's all right.

13 Q I'm thinking of Ms. Gilmar at her property enjoying the
14 water from the springs and Gold Creek.

15 A MR. HOUSTON: Mr. Secord, just to be clear,
16 the ESP is a settlement -- sedimentation pond, and
17 so --

18 Q I understand that, but it's going to be aboveground.
19 I'm just wondering what is --

20 A Yes.

21 Q -- downgradient -- what is downgradient from the ESP?
22 That's the only question --

23 A Yeah.

24 Q -- outstanding. I --

25 A Yeah, I know.

26 Q I understand -- I understand you're saying,

1 Everything's going to be wonderful; nothing's going to
2 be mobilized. But I just want to know what
3 downgradient is, and we'll leave that -- we'll leave
4 the debate over what might be coming Ms. Gilmar's way
5 or the way of the fish for a little later, when I talk
6 to your geochemist.

7 A Okay. I -- I -- I just wasn't sure that -- that you
8 were clear that that's a sedimentation pond that
9 doesn't have contact water in it. It's got water with
10 high sediment loads.

11 A MS. GRAINGER: So on CIAR 313, Addendum 11,
12 PDF page 311. I'll just wait till that comes up, but
13 there -- there is a map that was provided, and it
14 illustrates locations of monitoring wells. And there
15 are two, in fact, planned downgradient of the east
16 sediment pond.

17 Q What page is it? 311?

18 A Yes, 311.

19 Q Maybe while the Zoom master is getting Addendum 11,
20 picked out -- oh, he's there already. 311.

21 A Yeah. If you just scroll down a little bit further,
22 you can see "east sediment pond". Yeah. A little too
23 far. Sorry. Just back up a little bit. Yeah. Now
24 we're right near the top of -- right of the figure.

25 So there is, in fact, an existing monitoring well
26 in that area, and then there are two additional wells

1 that are proposed.

2 Q So basically that's -- that is -- let me just -- just
3 bear with me for a second.

4 So essentially the monitoring wells -- the one MW5
5 would be essentially directly above Fran Gilmar's
6 property in the southwest of 30, and then MW5-2 would
7 be basically on the north -- basically the northeast
8 corner of her property and the northwest corner of Vern
9 Emard's property; correct?

10 A I'll have to take your word on that. I -- yes.

11 A MR. HOUSTON: I -- I can confirm that,
12 Mr. Secord.

13 Q Okay. Thank you.

14 All right. So let's go to my next question. I
15 had to scroll up.

16 So I'm not sure who, Mr. Houston, is best to
17 handle this. Does Benga agree that sealing off faults
18 and fractures is a tricky activity? So that's the --
19 that's Part 1 of the question. And then the second
20 part is probably over to Ms. Grainger, which is: And
21 if successful, can result in changes to local
22 groundwater flow patterns? I suppose it may be a
23 hydrogeological question in its entirety in terms of,
24 you know, putting in grout curtains, you know, when you
25 think about, you know, some of the efforts that have
26 polluters -- that polluters have gone to to try and

1 prevent contamination from, you know, migrating off of
2 their properties. So maybe it's entirely to
3 Ms. Grainger.

4 Do you agree that sealing off faults and fractures
5 is a tricky activity and, if successful, can result in
6 changes to local groundwater flow patterns?

7 A MR. HOUSTON: So maybe I'll start, and
8 Ms. Grainger can add to that, Mr. Secord. We -- we
9 don't expect to find anything dramatic in these areas
10 that we're -- we're talking about the -- the ex-pit
11 rock dumps, I think, are we not?

12 Q No.

13 A Okay. Maybe I misunderstood the question, then.

14 Q Yeah. So the -- the general -- the general question
15 was that: Will Benga ensure that all faults and
16 fractures are identified and monitored accordingly so
17 that no contaminants bypass the surveillance system and
18 reach Blairmore and Gold Creeks? Okay? That was
19 the -- and then we have Ms. Grainger, who showed us
20 where there are a number of monitoring wells.
21 Presumably those monitoring wells, they were -- the two
22 new ones that were put in downgradient from the ESP
23 where -- to the north of where my clients Gilmar and
24 Emard live were put there for a purpose.

25 So the question was: Will Benga ensure that all
26 faults and fractures are identified and monitored

1 accordingly so that no contaminants bypass the
2 surveillance system and reach Blairmore and Gold
3 Creeks?

4 So I'm assuming that you're going to look at those
5 monitoring wells, and if there are contaminants in
6 MW5-1 or MW5-2, you're going to do something about
7 that. Or did you put them there just for the -- just
8 because you could? I don't know. Why did you put them
9 there?

10 A So I -- again, I -- I think the -- the -- the rigour, I
11 guess, that one would invest in sealing or otherwise
12 dealing with faults and fractures would -- would depend
13 on the expected consequences associated with that.

14 So directly with respect to Ms. Gilmar's property,
15 we're -- we're talking about a sedimentation pond and
16 the -- the opportunity for water in the sedimentation
17 pond to be -- well, it -- it won't be contact water.
18 And -- and so seepage of that water is a fairly benign
19 issue. So -- so I wouldn't expect to invest a lot of
20 time and -- and money in sealing off fractures.
21 Although we would -- we would want to understand that
22 the pond is -- you know, and it's got a solid bottom on
23 it.

24 Q Why were these two monitoring wells put in downgradient
25 from the ESP? What was the purpose of that, Ms.
26 Grainger?

1 A MS. GRAINGER: I think they were identified
2 as low risk, but it also demonstrates that there isn't
3 an impact to groundwater quality, so that is the intent
4 of this location. I can reference we have provided a
5 description of the groundwater monitoring program and
6 response plan which would, you know -- in all cases of
7 groundwater monitoring wells, we would be looking at
8 the groundwater quality data, comparing it against
9 thresholds, and in the event of a -- you know,
10 increasing trends or values that exceed certain
11 thresholds, there would be a response plan and actions
12 undertaken. So that's across the board regardless of
13 location, but in this instance, the sedimentation
14 ponds, as have been described, are low risk, but
15 proactively some monitoring was identified in order to
16 demonstrate that there isn't an impact to groundwater
17 quality in those areas.

18 Q Okay. Back to you, Mr. Houston, then. I think you
19 really thought that the sealing off of faults and
20 fractures would be, I guess, in areas around
21 the rock -- the rock pit areas? Do I understand that?
22 Is that where -- is that where they're really more
23 concerned to seal off faults and fractures?

24 A MR. HOUSTON: Certainly the more -- more
25 effort is required to investigate the -- the ground
26 underneath the rock dumps and to ensure ourselves, you

1 know, that all the organic material's stripped off.
2 We're going to construct subdrains. We're going to do
3 a number of things to try to facilitate the extraction
4 of water that seeps through those rock dumps, which
5 would be contact water.

6 Q So if you are successful in sealing off faults and
7 fractures, can that result in changes to local
8 groundwater flow patterns, Ms. Grainger?

9 A MS. GRAINGER: I think it would just depend
10 on the significance of the groundwater movement that
11 was occurring along that fault or fracture. I don't
12 know if that answers your question.

13 Q Do you agree that this could alter contaminant-movement
14 patterns and reduce the effectiveness of monitoring
15 wells positioned to detect releases from mine-related
16 structures and waste management areas?

17 A So if I understand you, you're asking if by sealing
18 faults and fractures that would reduce the
19 effectiveness of our monitoring program?

20 Q Yes. That could reduce the effectiveness of monitoring
21 wells positioned to detect releases from mine-related
22 structures and waste management areas?

23 A Well, my understanding would be that by sealing the
24 faults or fractures, if they were providing a
25 significant pathway for groundwater movement, that that
26 would require the groundwater to then move more through

1 the matrix of the rock as opposed to through fractures
2 or faults. It would move more slowly, and it would
3 make -- it would slow groundwater movement. It doesn't
4 necessarily affect the effectiveness of the groundwater
5 monitoring program. It's just going to result in some
6 changes and slow the groundwater movement potentially.

7 Q How will Benga determine the best locations to place
8 monitoring wells to ensure their continued
9 effectiveness once installed?

10 A MR. HOUSTON: So that's -- I was just going
11 to jump in and add on to Ms. Grainger's response and --
12 and comment that once we've done our investigation,
13 and -- and I'm talking about the ex-pit rock dumps
14 and -- and done the work that we're required to do
15 there, that -- that would inform the location of the --
16 final location of the monitoring wells. So the --
17 the -- the whole thing comes as a package, Mr. Secord,
18 and we -- we would use the best information we have
19 after that detailed investigation to perform the work
20 underneath the ex-pit rock dump and -- and to locate
21 the monitoring wells.

22 Q Yeah. Monitoring wells typically consist of small
23 diameter PVC pipes installed in 6-inch boreholes.
24 Given the size of the structures to be monitored and
25 the dominant control that faults and fractures are
26 anticipated to have on groundwater flow directions,

1 what spacing of monitoring wells is Benga proposing to
2 ensure that contaminant plumes are detected?

3 A MS. GRAINGER: I don't think it's so much a
4 question of spacing. Monitoring wells have been
5 located in all instances downgradient of potential
6 sources, and as we've discussed, they will be located
7 targeting preferential flow pathways once those have
8 been defined.

9 Q But you would agree that sealing fractures could push
10 groundwater away from installed monitoring wells,
11 Ms. Grainger?

12 A Well, I think the -- as Mr. Houston has discussed, the
13 intent is to look at this holistically, so we would
14 investigate, determine the locations of any significant
15 faults or fractures. There would be a determination on
16 which ones were going to be sealed, if any; and then
17 based on that, we would select the locations for the
18 monitoring wells.

19 Q Now, surge and sedimentation ponds, as well as waste
20 rock dumps, are to be established in upslope locations
21 to provide suitable setback from Blairmore and Gold
22 Creeks; correct?

23 A MR. HOUSTON: So they'll be located in
24 appropriate locations. All of the structures are a
25 hundred metres or more from Gold Creek and Blairmore
26 Creek.

1 Q Do you agree that being situated at a higher elevation
2 will result in a driving head of water that will push
3 any mobilized contaminants downward through the base of
4 these structures and into the underlying rock and
5 fracture systems?

6 A MS. GRAINGER: Mr. Secord, these structures
7 are planned to be lined, so there is a -- the surge
8 ponds.

9 A MR. HOUSTON: Just a minute, Mr. Chair.

10 Q I think you're wrong, Ms. Grainger. The sediment ponds
11 are not being lined, at least not as -- as of this
12 morning's evidence.

13 A MS. GRAINGER: My apologies, Mr. Secord. I
14 thought we were talking about the surge ponds, not the
15 sedimentation ponds.

16 Q My question is: Surge and sediment ponds as well as
17 waste rock dumps are to be established on -- in upslope
18 locations to provide suitable setback from Blairmore
19 and Gold Creeks. And then -- so that -- I think the
20 answer was yes. And then do you agree that being
21 situated at higher elevation will result in a driving
22 head of water that will push any mobilized contaminants
23 downward through the base of these structures and into
24 the underlying rock and fractures systems?

25 A MR. HOUSTON: So, Mr. Secord, the
26 sedimentation ponds and the surge ponds will -- will

1 be, let's say, 10 or more metres in depth, and so I
2 would expect that there -- yes, there -- there could be
3 a -- a hydraulic head created around those ponds, and
4 that would have a -- a limited effect on -- on pushing
5 groundwater downslope.

6 Q Do you agree that it is unclear how deep contaminants
7 will migrate before moving laterally so there is
8 considerable risk that they will eventually reach
9 Blairmore Creek and Gold Creek undetected?

10 A MS. GRAINGER: Generally speaking,
11 Mr. Secord, the -- any contaminants would migrate
12 downwards towards the water table and then migrate in
13 the water table following the groundwater flow path, so
14 that would be a combination of downwards and lateral.
15 It's not just down and then straight across. It -- it
16 would move through the unsaturated zone, if there is
17 such an unsaturated zone beneath the structure, such as
18 there is at some of the rock disposal areas, for
19 example, and then once reaching the water table, would
20 move in a combination of downwards and lateral.

21 Q Do you agree that considerable faith is being placed by
22 Benga on the groundwater monitoring? So how will Benga
23 guarantee nothing is missed and any impacts are
24 mitigated prior to and not after causing an adverse
25 effect?

26 A MR. HOUSTON: So, Mr. Secord, first of all,

1 the monitoring program that we've proposed is a layered
2 program. As Ms. Grainger pointed out, we'll have
3 monitoring wells adjacent to most of the structures.
4 We'll have additional groundwater monitoring wells
5 adjacent to the receiving environment, i.e., the
6 creeks, and -- and I think what's really important to
7 remember is the slow speed at which change occurs in
8 the groundwater environment. It -- we're talking about
9 changes on the -- on the scale of years, and so we
10 would expect to see at the monitoring wells a very,
11 very slow change in -- if -- if there was seepage and
12 there was a contaminant issue, very, very slow change
13 in concentrations commensurate from the movement of
14 water in that environment.

15 I guess a third layer, Mr. Secord, will be the
16 monitoring of the water in the creeks itself, and --
17 and that is another layer of monitoring where we would
18 expect any changes to occur very, very slowly, and
19 certainly giving sufficient time for a change in
20 strategies if required.

21 Q Okay. If we could turn up CIAR 42, Section E, PDF
22 page 126, and this is Heading E.6.3.1.3.2, "Potential
23 Changes in Water Quality", and the authors write:
24 (as read)

25 As the mine progresses through operations,
26 there's the potential for changes to sediment

1 and water quality variables that may have
2 chronic or lethal acute effects on aquatic
3 biota if they have the potential to enter the
4 aquatic ecosystem.

5 And then if we could turn up PDF page 216 of CR 3. And
6 this is under Heading 3.5, "Model Calibration", the
7 last paragraph. It says: (as read)

8 The overall calibration approach provides an
9 estimate of the regional 'K', storativity,
10 and recharge values; however, although
11 calibration is considered reasonable for
12 larger scale approximations, models may
13 exhibit large uncertainties at the local
14 scale due to localized heterogeneities not
15 recognized or incorporated into the larger
16 model.

17 How does this caveat provide confidence to the Joint
18 Review Panel that the SRK model is generating accurate
19 and reasonable results that significantly influence
20 ramifications for base-flow reductions and waste
21 assimilation calculations both during mine development
22 and post closure?

23 A MS. GRAINGER: Mr. Secord, I can just speak
24 to the model and the localized heterogeneities and --
25 and that specific piece.

26 So my understanding is your concern is: How do we

1 have confidence in the model given that there are some
2 uncertainties at specific locations? And that's a
3 function of the -- the model. It cannot accurately
4 represent -- it is a -- any model is a simplification
5 of a very complex system. It provides us an overall
6 understanding, and we believe it's representative in
7 terms of the base-flow reductions that are predicted.
8 Could there be variations at a specific location?
9 Potentially. But the overall understanding and -- and
10 predictions, we believe, are informative and do give us
11 confidence in completing the assessment.

12 Q And does this model factor in climate change?

13 A Climate change isn't explicitly incorporated into the
14 model. The model was calibrated, and as we've talked
15 significantly about, the sensitivity analyses -- and
16 that would be one manner in which potential changes,
17 such as climate changes and those effects -- could be
18 understood in terms of the model predictions, so
19 specifically recharge, which we've looked at earlier.

20 So if there's a change in recharge due to climate,
21 how would that affect the model? And the conclusions
22 were that the change resulting from the project itself
23 was consistent regardless of whether there was a change
24 in the overall amount of -- of recharge. So what I
25 mean is if a base-flow reduction of 10 percent was
26 predicted with the recharge that was used, that -- that

1 10 percent base-flow reduction would be maintained even
2 if recharge was reduced or greater.

3 MR. SECORD: Mr. Chair, I am going to move
4 on to a new area of questioning. You'll be happy to
5 know my questions on hydrogeology are over. I intend
6 to move into questions on groundwater/surface water
7 interaction and mine water balance, and then I have a
8 further area on geochemistry.

9 I wonder whether we should give the court reporter
10 a break now before I move into this new area?

11 THE CHAIR: I think that's a good idea,
12 Mr. Secord. I was about to suggest that.

13 So it's 2:30. We'll break till 2:45. And just by
14 way of time, depending on how we account for
15 yesterday's head start, if I'm generous, I'm going to
16 say you have probably about an hour and a half left of
17 your allocated time, Mr. Secord. I don't know how well
18 that works for your other questions, but just keep that
19 in mind.

20 MR. SECORD: Okay. Thank you. I'm hoping
21 you might give me another half hour, but I'll do my
22 best, sir, and obviously I know we -- Mr. Yewchuk
23 was -- he was very efficient yesterday, so it's a
24 difficult process estimating time, and --

25 THE CHAIR: Yeah. Understood.

26 MR. SECORD: -- also with, you know, the

1 responses. So I guess I'll see where I get. I did
2 have those climate-change questions left over. I've
3 got those at the end, so -- but I'll do my best.
4 Hopefully I can get the job done in the time allocated.

5 THE CHAIR: Okay. Thank you.

6 MR. SECORD: I will do my best.

7 THE CHAIR: Okay. Thank you.

8 We'll see everybody after the break.

9 (ADJOURNMENT)

10 THE CHAIR: Okay. Go ahead, Mr. Secord.

11 MR. SECORD: Thank you, sir.

12 And just to be clear, you'd like me to be
13 completed by 4:15, if at all possible?

14 THE CHAIR: Yeah. As I said, Mr. Secord,
15 I'll be flexible. I just want you to try and, you
16 know, continue to be efficient, and, you know, the goal
17 is to wrap you up today and hopefully not go too, too
18 late.

19 MR. SECORD: Sure. I really appreciate
20 that, sir.

21 Q MR. SECORD: So these next set of questions
22 are on groundwater/surface water interaction and mine
23 water balance.

24 I think, Ms. Grainger, do you agree there is no
25 indication of how areas of groundwater contribution to
26 streamflows were identified and quantified in Blairmore

1 and Gold Creeks?

2 A MS. GRAINGER: Sorry, Mr. Secord. Can you
3 rephrase the question perhaps. I'm not understanding
4 what you're asking.

5 Q Do you agree that there is no indication of how the
6 areas of groundwater contribution to streamflows were
7 identified and quantified in Blairmore Creek and Gold
8 Creek?

9 A From my perspective, there were -- you're correct in
10 that there were not specific -- we didn't map exactly
11 where and how much base-flow recharge was occurring
12 along Blairmore and Gold Creeks. The base flow was
13 estimated by reach.

14 Q Please turn up PDF page 236 of Appendix 10 of CIAR 42.
15 This is the water and load balance model. Appendix 10B.

16 A What was the PDF number, Mr. Secord?

17 Q 236. This is under "Model Description", and then 3.2,
18 "Scenarios", and Item 3, "Worst case for water
19 quality": (as read)

20 The "worst case" predictions was run using
21 the upper-limit source terms with average
22 hydrological conditions.

23 And maybe just to put this in context, maybe,
24 Mr. Jensen, this -- maybe this is you. The model --
25 under 3.1, the "Model Platform and Time Scale", the
26 water balance and quality model for the Grassy Mountain

1 Project was developed using the GoldSim software
2 package, Version 11.1, GoldSim Technology Group 2014.

3 So: (as read)

4 The water balance and load-modelling work
5 done to support this application indicates
6 that the worst case predictions were based on
7 upper-limit source terms and average
8 hydrological conditions.

9 Mr. Jensen, how is using average hydrological
10 conditions considered "worst case" when extreme or
11 upper-limit conditions would be more appropriate.

12 A MR. DAY: Mr. Secord, I think I -- I
13 kind -- I think I understand your question, but could
14 you -- which part of it are you -- are you asking about
15 the combination with the average hydrological
16 conditions or which part?

17 Q Exactly. So the worst-case predictions was run using
18 the upper-limit source terms with average hydrological
19 conditions. So how is using average hydrological
20 conditions considered worst case when extreme or
21 upper-limit conditions would be more appropriate?

22 A I think we'll need to confer for a moment on who should
23 respond to this question.

24 A MR. JENSEN: Good to go?

25 So, Mr. Secord, I will -- I'll answer this
26 question. It's Soren -- Soren Jensen here.

1 When we talk about the different -- the -- the
2 model scenarios that are listed in Table 3.1, we
3 specifically -- when we talk about a worst-case water
4 quality scenario, what we're looking at there, we're
5 looking at it as opposed to the base-case water quality
6 scenario. And when we look at water quality, what
7 really drives the difference in water quality is the
8 range of possible -- I -- I won't say "likely", but the
9 range of possible water quality conditions, which are
10 driven by the source terms much more so than any -- any
11 sort of hydrological variability we might -- we might
12 encounter.

13 So, you know, a lot of the times we're looking at
14 sort of an order of magnitude difference in source
15 terms, and we want to -- we want to fixate the -- the
16 assessment of water quality -- the potential water
17 quality outcomes. We want to look at those through the
18 lens of how do -- how do base-case source terms or the
19 expected source terms -- how do they stand up or how do
20 they compare to the worst-case source terms. So what
21 we do is we fix the hydrology, and then we look at that
22 dimension.

23 So I hope that answers your question. Like, it --
24 it's an examination of the effect of different source
25 term assumptions.

26 Q Okay. Let's turn up PDF page 236 of Appendix 10B. So

1 we're right there. And I read to you from Section 3.1
2 about the use of the GoldSim software package. So the
3 GoldSim software package is used to predict water
4 quality impacts, yet there is no description of how the
5 model was set up in the application documents.
6 Why is that?

7 And do you agree, Mr. Jensen, it is important to
8 communicate how a model is set up so that others can
9 review its efficacy?

10 A So I would -- I would respond to that by saying that
11 the GoldSim model is really nothing other than a
12 graphical user interface on -- on a spreadsheet model.
13 It's nothing we couldn't do in a spreadsheet that --
14 that -- or there's nothing you can do in GoldSim that
15 you couldn't do in a spreadsheet. So it really is more
16 a matter of, you know, I -- I -- the -- the assumptions
17 we've stated, the inputs we've used, and the model
18 assumptions we've used to arrive at our model results
19 are stated. You know, so we're happy to -- to discuss
20 them. We didn't prepare the -- the model code itself
21 for distribution, but, you know, an experienced
22 modeller would be able to look at our inputs here
23 and -- and replicate our results.

24 THE CHAIR: Sorry to interrupt. I just
25 want to check. I think we've lost Mr. Matthews. So I
26 just want to give him an opportunity to reconnect

1 before we continue.

2 Mr. Matthews is just trying to reconnect. Let's
3 just take a minute.

4 MS. ARRUDA: Mr. Chair, I believe we have
5 Mr. Matthews on the phone now while he's trying to
6 reconnect his audio and video through Skype.

7 THE CHAIR: Okay. Mr. Matthews, can you
8 hear us?

9 Mr. Matthews, can you hear us?

10 MR. MATTHEWS: Hello.

11 THE CHAIR: Okay. Can you hear us okay,
12 Mr. Matthews?

13 MR. MATTHEWS: Yeah, I can hear you fine.
14 Can you hear me?

15 THE CHAIR: Yeah. Okay. So we'll proceed
16 while you try and log back in on your video.

17 MR. MATTHEWS: Okay. I'll just listen on the
18 phone.

19 THE CHAIR: Thanks.

20 Sorry, Mr. Secord. Please proceed.

21 MR. SECORD: Thank you, Mr. Chair.

22 Welcome back, Mr. Matthews.

23 Q MR. SECORD: So, Mr. Jensen, are you saying
24 we are using a spreadsheet to understand water quality
25 and the fate of the westslope cutthroat trout?

26 A MR. JENSEN: Well, in as far as we're using

1 math, I mean, the -- the -- the type of computations
2 that go into this model you could do equally well in
3 the spreadsheet as you -- as you can in a GoldSim
4 model, the mechanics -- the conceptual model and the
5 mechanics of the computations are all the same,
6 whether --

7 Q Do you agree?

8 A Irrespective of -- of if you calculate it by hand or in
9 a spreadsheet or -- or in GoldSim. It -- it doesn't
10 make a difference.

11 Q Do you agree that the GoldSim model used in this report
12 also identifies some constituents in Blairmore and Gold
13 Creeks approaching or exceeding chronic guidelines for
14 the protection of freshwater aquatic life? These
15 include aluminum, ammonium, cobalt, selenium, and
16 mercury.

17 A Mr. Secord, that would be a question for my -- for my
18 biology colleagues who handled the -- the aquatic
19 toxicity aspects of this project.

20 Q And who are they?

21 A That would be Martin Davies.

22 Q And is he there?

23 A Yes.

24 Do you -- do you want to take it, Martin?

25 A MR. DAVIES: Yeah, I can.

26 A MR. JENSEN: Okay.

1 A MR. DAVIES: Hi, Mr. Secord.

2 I -- I will need to look that up, but from what
3 you've said, it sounds correct.

4 Q Are you with SRK?

5 A I am, yes. I'm -- I don't work with SRK. I mean I'm
6 in the same room as SRK, but ...

7 Q Okay. Okay. This is the SRK water and load balance
8 model.

9 Are you familiar with the appendices
10 essentially -- they're not bookmarked for some strange
11 reason, but are you familiar that in Appendix 10B there
12 is something called an "Appendix D3", which is the
13 Blairmore Creek water quality projections from PDF 309
14 to 334, and in Appendix D4 of Appendix DP -- of
15 Appendix 10B of -- of CIAR 42 --

16 A Yeah.

17 Q -- whereas the Gold Creek water quality projections
18 from PDF pages 335 to 360, have you taken a look at
19 those?

20 A MR. HOUSTON: So, Mr. Secord, I -- I think
21 we're -- we're just a little bit confused about what
22 the question is. So in terms of --

23 Q Well, there's --

24 A No. Yeah. No.

25 Q There's no question.

26 A Yeah. Okay.

- 1 Q There's no question yet.
- 2 A Yeah. No. So I just want to make sure we have the
3 right person talking with you. If it's with regard to
4 the numbers that were generated and what the values are
5 under various scenarios, that's the person who ran the
6 model, which would be Mr. Jensen, supported by others.
7 If it's with regard to what is the health effect on the
8 fishies [sic] downstream, Mr. Davies could be more
9 appropriate. And -- and so I -- you know, I'm just not
10 sure where you're going with your question.
- 11 Q Okay. So what I'm -- what I'm looking at is the SRK
12 data, and I'm particularly interested in some of these
13 water quality projections that are in these appendices.
14 So perhaps what we could do, maybe, is just turn up --
15 let's take a look at aluminum.
- 16 A Do you have a PDF page, Mr. Secord?
- 17 Q I do. PDF page 337. And I'm looking at BL02. Sorry.
18 I'm sorry. I've got -- this is -- this should be GC --
19 this is -- should be GC10; right? It's so hard to
20 read, but this doesn't look -- this doesn't look right.
21 Are we on 337? We are.
- 22 A So this is Gold Creek --
- 23 Q Yeah, it is.
- 24 A -- values here.
- 25 Q I've got to pull up my document 'cause, unfortunately,
26 it's really hard to see on the Zoom screen here. So

1 I'm going to pull up my document.

2 MR. SECORD: All right. Okay. So I'm
3 sorry, Zoom Host. So the first document I want to take
4 a look at is PDF page 311. And this is the Blairmore
5 Creek 02 reach, and this is the second graph -- sorry.
6 Yeah. The -- it would be the third -- the third graph
7 here. So BC -- there we go. BL02. My apologies.

8 Q MR. SECORD: So I'm not sure who's going to
9 answer this question, but as I understand it, the
10 GoldSim modelling is predicting that the aluminum
11 concentration in Blairmore Creek at its peak between
12 2039 and 2043 will be point -- approaching
13 .045 milligrams per litre; correct?

14 A Yes, that -- that's correct.

15 Q And would you agree, subject to check, that the FWAL is
16 point -- 0.05 for aluminum? Do you know what the FWAL
17 is?

18 A I believe that's correct.

19 Q Okay. So do I understand, then, that this -- that the
20 GoldSim modelling is projecting that the aluminum
21 levels in Blair [sic] Creek will be essentially
22 approaching the FW -- can we call it the "FWAL" for
23 aluminum?

24 A MR. HOUSTON: So, Mr. Chair, we -- we have
25 recognized in our reporting that a number of metals
26 approach or even -- even marginally exceed -- and I'm

1 not talking about selenium, but other metals, like
2 aluminum, zinc, they approach or even exceed allowable
3 guidelines. And what we've proposed in our -- our
4 project is that as -- as we get a better handle on what
5 the final values may be, it's -- it's important to
6 remember that these values are calculated based on
7 conservative assumptions and early data. It's also
8 important to recognize that the buildup occurs over 15
9 or 20 years. And so as we get a better appreciation
10 based on real-world experience with the mine, we'll
11 possibly need to implement a metal treatment plant,
12 which we've committed to as part of our application, if
13 required.

14 Q And if we turn up to PDF page 325. And this is the
15 second graph here showing BC07, "Ammonium Concentration
16 Milligrams Per Litre". Can we agree that in this reach
17 of Blairmore Creek, the ammonium level reaches
18 5 milligrams per litre --

19 A That's what the --

20 Q -- Mr. Jensen?

21 A That's what the modelling shows.

22 Q Right. Yeah. And then can we agree that this -- the
23 maximum level that -- where it reaches a peak of
24 5 milligrams per litre in 2039 is well over the
25 1.5-milligram-per-litre threshold in the 2014 and 2018
26 Alberta Environment guidelines?

1 That would be a question for the Hatfield witness.

2 A We're just confirming that, Mr. Secord. One minute.

3 MR. SECORD: Maybe while they're
4 conferring, Zoom Master, would you turn up AQ1 AEP
5 environmental quality surface water guidelines from
6 2014?

7 Q MR. SECORD: This is the Coalition aid to
8 cross. So it's -- this is described as "AQ Number 1,
9 Coalition AEP Environmental Quality Surface Waters 2014
10 Water Topics". That's not it.

11 A MR. HOUSTON: Mr. Secord, we're going to
12 have to get back to you on the question around ammonia.
13 It's going to take a little bit of time for us to look
14 things up. So what I understand you want to know is
15 whether these predictions exceed the water quality
16 parameters for Blairmore Creek.

17 Q Okay. That's great. I've produced an aid to cross
18 here, which are the AEP environmental quality surface
19 water guidelines for 2014. Those were the guidelines
20 that SRK used in the -- in the GoldSim model; correct?

21 A MR. JENSEN: Mr. Secord, I'm just reminding
22 myself whether we did put in guidelines 'cause the way
23 the workflow worked in -- in this model assessment is
24 that we -- we did the characterization of site,
25 compiled the inputs, completed the model, and the model
26 results then were handed off to Hatfield for an

1 assessment of --

2 Q Okay.

3 A -- potential aquatic effects. So let me --

4 Q So the --

5 A Let me just --

6 Q So the Hatfield witness can just confirm these are the
7 guidelines that Hatfield used to determine whether some
8 of these metals were above or below the FWAL
9 guidelines; is that correct?

10 A MR. DAVIES: Yeah, that would be correct,
11 Mr. Secord.

12 MR. SECORD: Can we mark this as the next
13 exhibit?

14 THE CHAIR: Any concerns, Mr. Ignasiak?

15 MR. IGNASIAK: No, sir.

16 THE CHAIR: Okay. Do we have a number?

17 MS. ARRUDA: Elaine Arruda here. The next
18 CIAR number is 849.

19 THE CHAIR: Thank you.

20 EXHIBIT CIAR 849 - AQ#1 - COALITION - AEP
21 ENVIRONMENTALQUALITYSURFACEWATERS - 2014 -
22 WATER TOPICS

23 MR. SECORD: And then can we pull up AQ
24 Number 2, Coalition AEP environmental quality surface
25 water guidelines, March 28, 2018?

26 Q MR. SECORD: And perhaps I can ask the

1 Hatfield witness: Have these guidelines superseded the
2 2014 guidelines?

3 A MR. HOUSTON: Mr. Secord, we're -- we're
4 going to have to take an undertaking to get a response
5 on the ammonia question.

6 Q I'm not asking that question now.

7 A Okay.

8 Q Mr. Houston, you're behind.

9 A Okay.

10 Q So I think the question -- I think we've already got
11 that undertaking.

12 A Okay.

13 Q But the next question was the -- this aid to cross, the
14 2018 Alberta government environmental quality
15 guidelines for Alberta surface waters, this document
16 has now superseded the 2014 guidelines that have been
17 marked as CIAR 849; correct? That would be a question
18 for Hatfield.

19 A MR. DAVIES: Yes, that's correct.

20 MR. SECORD: And can we mark this as
21 CIAR -- the next CIAR exhibit?

22 THE CHAIR: Mr. Ignasiak, no concerns?

23 MR. IGNASIAK: No concerns.

24 THE CHAIR: Okay. Can we get a number?

25 MS. ARRUDA: Mr. Chair, that will be
26 CIAR 850.

1 THE CHAIR: Thank you.

2 EXHIBIT CIAR 850 - AQ#2 - COALITION - AEP
3 ENVIRONMENTALQUALITYSURFACEWATERS - MAR28 -
4 2018 - WATER TOPICS

5 MR. SECORD: All right. And then if we
6 could turn to PDF page 357 of the GoldSim projections.
7 This is Appendix 10B in CIAR 42. We're at page 357.
8 So can we have the -- the GC02 graph -- you're going to
9 have to scroll down. Right.

10 Q MR. SECORD: So I believe this is the
11 stretch or the area of Gold Creek that had previously
12 been identified as having dried out in September of
13 2016. And if we look at this model projection, it
14 shows that starting in 2037, the selenium levels move
15 up to .002 and then remain above .002 up and to the end
16 of 2099. Can you confirm that this -- the selenium
17 FWAL is .001 milligram per litre?

18 A MR. DAVIES: No. It's .002 milligram --
19 or, yeah, 002 milligrams per litre, 2 micrograms per
20 litre.

21 Q Well, I don't think you're right. Let's go to -- let's
22 go to --

23 A Mr. Secord, it's PDF page 35.

24 Q No. Let's go to Table B8, "Dissolved Metal Results",
25 page 137 of CR Number 3 of CIR -- CIAR 42. Perhaps you
26 haven't seen this document, Mr. Davies. 137.

1 All right. So you have identified as Exhibit A49
2 the 2014 FWAL ESRD aquatic life guidelines. On this
3 table, the FWAL for selenium is .001.

4 A Yes. That's not exactly correct. There's -- if you
5 look in the 2018 guidelines document that's also an aid
6 to cross there, you'll see that there's two -- there --
7 there's a guideline of 2 micrograms per litre and
8 there's an alert concentration of 1 microgram per
9 litre, and that 1 microgram per litre value is intended
10 to use in high-risk environments where there's a high
11 risk of selenium accumulation through selenium cycling
12 in the environment.

13 Q So you're --

14 A But in this case, that is not the case.

15 Q So you're saying this Millennium document, this
16 Table B8, "Dissolved Metals Results", the number that's
17 recorded there as the FWAL is incorrect?

18 A They've used an overly conservative number. The number
19 that they should've used that would apply to this case
20 would be .002.

21 Q Okay. So back to the previous document. The GC02
22 selenium is above .002, the level -- the FWAL level
23 from two thousand and -- approximately 2041 through to
24 2099? It's above the FWAL?

25 A MR. HOUSTON: This -- Mr. Secord, this --
26 this graph has been updated. This -- this particular

1 graph reflects the possibility of having the in-pit
2 lake outflow into Gold Creek which has since been
3 shelved, so we're not -- we're not doing that. So
4 there -- there is a new graph in -- I believe it's
5 Addendum 10. Is it Addendum 10? Yeah. We're just
6 confirming that. But it's in Addendum 10. We redid
7 all of these graphs based on another information
8 request, and Gold Creek remains below .002 micro --
9 milligrams per litre or 2 micrograms per litre.

10 Q Do you have that reference?

11 A We're -- we're looking for it.

12 Q Maybe I'll just carry on, and you can give that to me.

13 A We -- we have it, Mr. Secord, so why don't we just
14 close this off?

15 Q Sure.

16 A Can you just do it, Mike?

17 A MR. BARTLETT: Mr. Chair, it's Registry
18 Document 313. PDF page 250 is the relevant information
19 request, and there's a series of figures that speak to
20 these updates.

21 Q Okay. Thank you.

22 So given the -- these numbers and the updated
23 numbers, do you agree that there is a likelihood that
24 the contaminant levels could be higher than reported if
25 mitigation techniques are not as effective as -- as --
26 as hoped for?

1 A MR. JENSEN: So, Mr. Secord, as we sort of
2 clearly state in the -- in the introduction to this --
3 this model assessment and -- and, indeed, the purpose
4 of this model assessment is to define what's required
5 in terms of mitigation, that's -- that's -- I would say
6 that's the primary purpose of this model assessment.

7 So, you know -- and we also clearly state in
8 our -- in our assumption and, indeed, in the
9 conclusions that -- that the design basis that we
10 derived based on these model results need to be met;
11 otherwise -- otherwise, yes, the -- the projections
12 that we include in this model assessment here wouldn't
13 apply. So it's -- it's -- it's a bit of a circular
14 argument in that sense.

15 Q Now --

16 A MR. HOUSTON: If I could just add to that,
17 Mr. Secord, just add to that answer a little bit.
18 We -- we have provided Plan B and Plan C. Of course
19 we've talked about the saturated backfill zone as the
20 primary treatment for selenium, for example. But we --
21 we have -- we have provided other backup plans,
22 including a commitment to install a -- a -- a water
23 treatment plant or a gravel bed reactor, if -- if
24 necessary, to run in parallel or -- or in -- in -- in
25 replacement of the saturated backfill zone.

26 Q Okay. So given that the GoldSim modelling is showing

1 that contaminant levels in both the water management
2 structures and creeks will be approaching or exceeding
3 Alberta's chronic guidelines for the protection of
4 aquatic life, you mentioned, I guess -- you indicated
5 that water treatment may be required or will be
6 required?

7 A So we have to understand that the -- the predictions of
8 the model are based on conservative assumptions that
9 are yet to be realized, and so we have -- we have
10 committed that, for example, if arsenic is -- is a
11 metal of concern and over the early years of operation
12 appears to be exceeding requirements, that we will
13 install a water treatment plant to -- to deal with that
14 issue and the -- and so -- so we have committed to
15 that.

16 We have --

17 Q Okay.

18 A -- also committed to backup plans if the saturated
19 backfill zone, which is treating things like nitrogen,
20 ammonia, and selenium, is -- is not -- not operating as
21 expected.

22 Q And do you agree that the proposed method is to use
23 lime that will result in a high-density sludge?

24 A One minute.

25 A MR. JENSEN: Yeah. I mean, when -- when we
26 looked at the model results generated to date, and,

1 again, in the spirit of defining mitigation measures,
2 it -- it would appear -- it appeared at the time that
3 some dissolved metals might be of concern. So the use
4 of high-density sludge treatment, lime treatment is --
5 is -- I would call it the standard. It -- it's a very
6 common approach for -- for treating for -- for removing
7 dissolved metals, so that's what we've proposed.

8 Q So it is unclear how this treatment sludge will be
9 disposed of. Where does Benga plan on disposing
10 this -- of this sludge, and what will be the risk to
11 groundwater and surface water from the disposal of the
12 sludge?

13 A MR. HOUSTON: Mr. Chair, using -- using this
14 water treatment process that Mr. Jensen has proposed,
15 this -- this is a standard kind of process that you
16 might find in -- in sewage treatment plants or other
17 industrial applications.

18 We would -- if and when we need to implement the
19 metals treatment plant, we'll work with -- we'll --
20 we'll -- we'll develop a plan for properly disposing of
21 the sludge, which -- which would be similar to what you
22 would find in -- in another treatment plant of the --
23 of the same type.

24 Q So if we could turn to PDF page 240 of Appendix 10B of
25 CIAR 42. It states here in this first bullet:
26 (as read)

1 Waste rock hydrology was simplified. Runoff
2 from waste rock disposal areas was assumed to
3 accumulate in the waste rock pile and seep
4 out once the pile had wet up and field
5 capacity of 3 percent had been reached.

6 After the storage capacity of the waste rock
7 was reached, runoff from the area responds
8 immediately to changes in precipitation.

9 Why was a field capacity of 3 percent selected, and
10 what is Benga's justification for selecting that value?

11 A MR. JENSEN: Well, it's -- it's -- first of
12 all, it -- Mr. Secord, I would say that it correctly
13 should've stated a -- an increase in 3 percent is -- is
14 the number that was used to -- and -- and it was -- it
15 was selected as a -- I'd say a very conservative
16 number. Typically, I mean, for this type of waste
17 rock, we might expect to see field capacities -- you
18 know, we might expect to see mine of -- run of mine
19 rock come in at around 3 percent in situ as it is, and
20 then it might increase to somewhere in the
21 neighbourhood of -- of 8 to maybe 11 percent, depending
22 on the -- the material, the characteristics of the
23 material.

24 In this case, we -- we elected to assign a value
25 of 3 percent sort of above what it comes in with to be
26 conservative 'cause that means that waste rock seepage

1 would emerge that much earlier --

2 Q So --

3 A -- in our modelling. So it's really just a
4 conservative assumption.

5 Q So what did it come in at? You said it -- you said
6 that it should have read -- you increased it by
7 3 percent?

8 A Yeah.

9 Q What was the number that you increased?

10 A Well, I mean, typically it comes in at 3 percent
11 already. What we're interested in is how much more
12 water will be retained in the waste rock mass before it
13 starts to drain. So the 3 percent -- the 3 percent
14 is -- is -- is the additional moisture or additional
15 water that needs to be added to the waste rock before
16 it starts to drain freely.

17 Q If a higher value, like 5 percent or 10 percent, had
18 been selected, how would this have affected model
19 outputs and mine water balances?

20 A It would just take that much longer before the seepage
21 would start to emerge from the toe of the waste rock
22 dump.

23 Q Okay.

24 A So any effect that you see represented in the model
25 would -- would be delayed by, you know, the
26 corresponding amount of time.

1 Q All right. So I'd like to now move to geochemistry
2 questions.

3 So Benga chose to only model dissolved
4 concentrations of contaminants and not total
5 concentrations; is that correct? This may be for
6 Mr. Stephen Day, but ...

7 A MR. DAY: Yeah, I can -- I can answer
8 that, Mr. Secord. Yeah, so the -- the modelling that
9 we do is intended to understand what happens when rock
10 starts to break -- when it kind of weathers and breaks
11 down. And those processes are creating soluble
12 minerals that go into solution, and so that -- or
13 that -- so the -- the water that's inside the waste
14 rock is -- contains dissolved concentrations. It's
15 only when that emerges that you get erosion occurring
16 that adds to the -- the suspended load and makes --

17 Q Right.

18 A -- makes up the total. So that's -- that's why we --
19 when we do the -- what we call a "source term
20 prediction", we focus on the dissolved concentrations.

21 Q Do you agree that the use of total concentrations
22 would've been more conservative and reflective of the
23 effluent that will discharge from the mine water
24 management structures?

25 A Soren, I think maybe you -- could you speak to how
26 the -- 'cause, I mean, usually what we do is we add the

1 load from the dissolved to the -- to the totals from
2 the background areas. Could you speak to that, please?

3 A MR. JENSEN: Yeah, I can. I just need one
4 minute here to -- actually, I -- no. I -- I'll -- I'll
5 outline that. So what we did from -- with respect to
6 the -- the water management structures, yes, it's --
7 it's -- we did, indeed, use the dissolved
8 concentrations from those structures, and then we -- in
9 the model, we mixed them in with that dissolved
10 component, in with the -- both dissolved and totals.
11 So we added those dissolved components to the dissolved
12 and total from our assumed background concentrations.

13 Q Okay.

14 A So, yes, it -- it would be more conservative to -- to
15 assume some solids load, but what -- what we
16 effectively assumed is that the -- that the
17 sedimentation structures operate as designed.

18 Q So why did Benga decide to use -- or why did SRK decide
19 to use this less-conservative approach?

20 A Again, the -- the purpose of the assessment here is
21 to -- is to evaluate what sort of mitigation's
22 required. And given the fact that, you know, we have
23 incorporated the -- the operation of sedimentation
24 ponds into this assessment, it -- you know, it -- it
25 it's consistent, I think, with the fact that our
26 assumptions, as clearly stated in this -- in this model

1 report, that we assumed that the mitigation measures
2 that are reflected here are effective.

3 Q So if we could turn up Table B8, "Dissolved Metals
4 Results", page 137 of CR Number 3. And if we scroll
5 down to PDF page forty -- 142, we have, essentially,
6 the values exceeding freshwater aquatic life and
7 drinking water guidelines. That's the brown. Then a
8 sort of salmon colour, value exceeds freshwater aquatic
9 life guidelines, and then the blue, we have values
10 exceed drinking water guidelines.

11 So over these -- essentially from pages 137 to
12 142, we have -- we have these various categories --
13 various metals listed, right, at the top of the
14 document in Table B8, the "Dissolved Metals Results";
15 correct? Mr. Day?

16 A MR. DAY: Yeah, that's what the -- the
17 table says, yeah.

18 Q And has this table been updated as a result of the new
19 work that was done in Addendum Number 10?

20 A MR. HOUSTON: Um --

21 A MR. DAY: Sorry. Go ahead, Gary.

22 A MR. HOUSTON: No. So I -- I was going to
23 say: Mr. Chair, could we just take a minute to --
24 before we respond? One minute.

25 Mr. Secord, Mr. Chair, these are -- these are
26 water samples that were taken in our efforts to collect

1 data. Most of these are groundwater samples. And just
2 wondering how you're connecting this to the modelling?
3 These are samples of water in -- from -- from wells
4 from 2015.

5 Q Okay. So my understanding is that -- that Mr. Day was
6 saying that that FWAL line was inaccurate in terms of
7 some of these model guidelines.

8 A The -- so Mr. Davies responded to that, and he -- he
9 talked about the selenium number, which, as he pointed
10 out, the -- the 1 microgram per litre for selenium is a
11 conservative guideline used in -- in the most high-risk
12 waters, which means risk in terms of selenium uptake
13 into the -- the -- the aquatic biology. And -- and
14 that one he -- he corrected and said that .002 -- or
15 2 micrograms per litre -- is a more appropriate number.

16 Q Yeah, and I appreciate that --

17 A MR. DAVIES: If I could -- sorry. If I
18 could add to that, just to clarify. The guideline is
19 2. The alert concentration is not formally considered
20 a guideline.

21 Q So I'm just -- I mean, you and I were talking about the
22 GoldSim modelling, obviously, and the results done in
23 Addendum 10 and, you know, what they showed, but this
24 particular table obviously is looking at -- at what has
25 been, I take it, measured at various locations, you
26 know, obviously starting on this page with the Bellevue

1 mine, but do I understand that -- that some of these
2 guidelines -- these FWAL numbers are wrong in this
3 document? Are you saying that, for instance, for
4 selenium, these shaded areas are wrong, that they
5 shouldn't be shaded orange?

6 A Now, if I could clarify, this is data for 2016. It is
7 using the 2014 guidelines. And -- and in the 2014
8 guidelines, as you showed in your aid to cross, the --
9 the guideline was 1 in -- in Alberta. And that -- that
10 had been taken from a 1987 guideline for -- that was
11 produced by CCME.

12 The current Alberta guideline is derived from the
13 BC 2014 guideline and was adopted after this table
14 would've been made. So it's not incorrect, but it's no
15 longer accurate with regard to the current set of
16 guidelines.

17 Q And it hasn't been updated for the -- for the Joint
18 Review Panel?

19 A This table?

20 Q Yes.

21 A I'm -- I can't speak to that, actually. No. It's
22 included in the baseline from 2016, I believe.

23 Q Okay. So as things stand, then, the presence of some
24 trace elements of levels above established guidelines
25 for drinking water and/or the protection of freshwater
26 aquatic life has been confirmed in some of the

1 monitoring well samples assessed by Benga. So
2 that's --

3 A MR. HOUSTON: That's -- that's correct.

4 Q So that's what's produced at Table B8?

5 A That's right.

6 Q And do you agree that in addition to selenium, this
7 includes aluminum, cadmium, chromium, copper, mercury,
8 nickel, and zinc?

9 A I -- I -- I would note, Mr. Secord, that in -- in some
10 of the samples, that is correct, but not in all.

11 Q Do you agree that these results indicate their natural
12 presence in the waters of the project area and the risk
13 of them being mobilized as a result of Benga's mining
14 and waste management processes? This would probably be
15 a question for Mr. Day.

16 A So what -- what -- I'll -- I'll start, and -- and if
17 Mr. Day has something to add, he -- he can jump in, but
18 these water samples were taken at a variety of
19 locations, and some of them were in historical mining
20 works, for example, or close to, and -- and so we would
21 expect -- first of all, we expect some level of all of
22 these elements to be -- to be present in -- in most
23 water samples, and I -- I think we need to get down to
24 specifics of each sampling location to -- to understand
25 whether -- whether an exceedance in one location is a
26 significant issue.

1 MR. SECORD: Well, let's look at PDF 137,
2 Zoom Master.

3 Q MR. SECORD: So these are some of the
4 few -- the -- some of the 19 monitoring wells that you
5 managed to drill on the project area; correct?

6 A That -- that's correct.

7 Q That's what you're talking about in terms of
8 exceedances of FWAL and guidelines? That's a good
9 picture of -- of what you found from some of the
10 19 wells that were drilled that weren't -- didn't end
11 up being dry?

12 A Yeah. Yeah. So -- so, Mr. -- Mr. Chair, Mr. Secord,
13 yes, these are -- these are samples that are taken from
14 groundwater wells, and, you know, using a wildlife
15 criteria for groundwater is -- is not really
16 appropriate. It's -- it's a way for us to identify
17 and -- and screen the -- the various elements that may
18 be present in the water. But using a -- a wildlife
19 lens and -- and saying there's an -- exceedances,
20 it's -- it's really just to highlight which -- which
21 elements are -- are -- need to be looked at closely --
22 more closely.

23 Q What do you mean by "a wildlife lens", Mr. Houston?

24 A The -- the FWAL is -- aquatic life. I'm sorry.

25 Q You thought it was wildlife?

26 A No. No. I -- I misspoke, Mr. Secord.

1 Q Yeah, you did.

2 You might not want to jump in in the rest of these
3 questions, Mr. Houston.

4 If you could turn up -- so -- so do you agree that
5 the results -- these results indicate their natural
6 presence in the waters of the project area and the risk
7 of them being mobilized as a result of Benga's mining
8 and waste management processes? And that's a question
9 for you, Mr. Day.

10 A MR. DAY: Yeah, I'll -- I'll -- I'll
11 take that.

12 So, yeah, you -- you're correct that we -- we do
13 look at -- we look at waters that are close to the --
14 the mine -- the existing mine operations as a -- as
15 a -- an indication of what might leach from them. And
16 we -- we actually did incorporate that into our
17 assessment. So it is -- it is appropriate to use the
18 data that way, yeah.

19 Q Do you agree that there is no SRK modelling done to
20 explore how these contaminants might be mobilized and
21 moved through the subsurface of the mine project area?

22 A Actually, we do. We use the -- we do -- we do
23 modelling of the -- the waste rock dumps, for example,
24 of pit walls to -- to understand what mobilizes from
25 the -- from them.

26 Q And where are those model results?

1 A You can look in Appendix 10.

2 Q Okay. I've done that. I've done that. I know where
3 those are.

4 A Yeah. So --

5 Q And we're going to look at some of those.

6 A Okay.

7 Q Okay. I'm trying to speed through my questions, as my
8 time is evaporating.

9 Oh, yeah. Yeah. So this is interesting. So
10 please turn up PDF page 112 of Addendum 10, which is
11 Package 5 of CIAR 251. So the response here -- so:
12 (as read)

13 So identify all planned source locations,
14 i.e., rock pile areas and other -- any other
15 potential sources of contamination, including
16 sources that may arise due to extreme flood
17 events.

18 And then the response is listed. And I want you to
19 focus on the last sentence here. It says: (as read)

20 The end-pit lake is not identified as a
21 potential source as the water stored in the
22 lake is located in its own groundwater
23 catchment area.

24 The statement then is made that the EP -- the end-pit
25 lake is not identified as a potential source of
26 contamination to the groundwater and potential

1 receptors; correct?

2 A I -- I see that, yeah.

3 Q So if we turn up Appendix 10B, the water and load
4 balance model in CIAR 42, and then if we go to PDF
5 page 380. This shows the pit lake -- the mercury level
6 in the pit lake; correct?

7 A Yeah. Correct. Yeah.

8 Q And it shows from 2040 -- 2041 on that the mercury
9 level is at -- at or above .000012. Can you confirm
10 that the FWAL for mercury is .000005?

11 A I'll have to let Martin respond on that.

12 A MR. DAVIES: Yes, I believe that's correct.

13 Q Okay. And then if we turn to PDF page 404. For the
14 end-pit lake, we have the selenium concentrations --
15 starting in 2041 and continuing to 2099, the selenium
16 levels being at .006, which is well above the FWAL of
17 .0002; correct, Mr. Davies?

18 A It -- it's above .002.

19 Q Right. And have these -- and were these -- were these
20 projections also changed in Addendum Number 10, or did
21 they remain the same after you reworked the model?

22 A MR. HOUSTON: I -- I don't believe the
23 numbers for the end-pit lake changed, Mr. Secord.

24 Q Right. And then if we go to PDF page 410 for the
25 end-pit lake, we see zinc levels from 2041 to the end
26 of the life -- to the end of the next -- or I guess the

1 end of this century at .03 -- sorry, at -- at above
2 .05. Can you confirm, Mr. Davies, that the FWAL is --
3 is .03?

4 A MR. DAVIES: Yes, I believe that's correct.

5 A MR. HOUSTON: So, Mr. Secord, we -- we
6 recognized that the numbers in the end-pit lake based
7 on the modelling that we've done to date, in a few
8 cases, may exceed water quality guidelines. We -- we
9 also understand that we -- we have options for -- for
10 treatment, especially of the metals or of the selenium.
11 So there are options available.

12 But more -- more importantly, with the
13 conservative nature of the modelling, we -- we'd like
14 to get a little bit further down the line so that we
15 could see which of those mitigation measures, if
16 necessary, would be best suited to -- to managing the
17 water in the end-pit lake.

18 Q If we could turn up PDF page 255 of the same appendix,
19 10B. And this is under the heading 5.4, "Concentration
20 Limits". And in the second sentence, it states:

21 (as read)

22 Elevated concentrations in pit lake water may
23 occur due to potential acidity. Pit lake
24 water leaves the project area via two
25 pathways: One, as overflow to the northeast
26 sedimentation pond and subsequently to Gold

1 Creek via horizontal drains after reaching
2 the flood elevation; two, as leakage. Once
3 the pit lake begins to fill, pit lake leakage
4 reports to Gold Creek at Prediction Node
5 GC10.

6 I take it, Mr. Houston, all of this has changed? None
7 of this is correct information?

8 A We're -- we're not currently planning an overflow for
9 the end-pit lake. That's correct.

10 Q So the overflow to the NESP is not something that
11 you're applying for?

12 A No.

13 Q And in terms of this Point Number 2: (as read)

14 As leakage, once the pit begins to fill, pit
15 lake leakage reports to Gold Creek at
16 Prediction Node GC10.

17 How was that determined?

18 A MR. JENSEN: So that was determined based
19 on sort of the general direction of the groundwater
20 flow in -- in that area. We looked to -- we looked to
21 the groundwater model assessment for some input to what
22 appropriate assumption to apply in this case.

23 Q Okay. So I thought, Mr. Jensen, from my extensive
24 conversation with Ms. Grainger, that the groundwater
25 flow was north-south, that the model constrained
26 groundwater flow to -- from the -- from -- in the

1 directions from the west to the east and from the east
2 to the west. So I just am confused now how you're
3 saying that the groundwater flow would be east --
4 sorry -- yes, it would be east from the end-pit lake.

5 A I apologize, Mr. Secord. We're just debating who best
6 to answer this question. I think Nancy will handle it.

7 A MS. GRAINGER: I just wanted to provide a
8 clarification, Mr. Secord, 'cause this morning we were
9 speaking of hydraulic conductivity and the differences
10 in the north-south direction versus east-west, and
11 that's not synonymous with the direction of groundwater
12 flow. So I can provide you references to maps in
13 CR 3 -- 'C' -- Consultant Report Number 3 which show
14 the groundwater flow direction, but it's -- it's not
15 just north-south or east-west.

16 Q And what is the groundwater residence time from the --
17 travel time from the end-pit lake to Gold Creek?

18 A Well, perhaps the map that is relevant is to look at
19 Consultant Report Number 3 in CIAR 42, PDF 109.

20 Q Is that the one we looked at already?

21 A No. This is a different map than what we've looked at
22 previously. This map shows the groundwater flow
23 contours at long-term closure. Or, sorry, the flow
24 direction at -- at -- at long-term closure.

25 So this map shows in the area of the end-pit lake
26 at the north end that there's a -- sort of a mini

1 groundwater basin that's formed where the -- the mining
2 has occurred, and groundwater flow direction is
3 actually very localized and towards that end-pit lake
4 in that area.

5 Q Okay. So going back to your August 2019 response to
6 the information request in CIAR 251 that the end-pit
7 lake is not identified as a potential source of
8 contamination and the statement in -- in -- on PDF
9 page 255 of Appendix 10B in CIA 42, that is leakage --
10 (as read)

11 Once the end-pit lake begins to fill, pit
12 leakage reports to the Gold Creek Prediction
13 Node GC10.

14 Can you -- can you tell me -- can you explain this
15 discrepancy?

16 A MR. JENSEN: Well, I would say -- oh, am
17 I ...

18 Q Yeah, you're on.

19 A Okay. There appears to be -- it might have been a
20 misinterpretation of some sort in classifying this as
21 not a -- as a source. It certainly is incorporated in
22 our water and load balance as a source. So there might
23 have been a misunderstanding on the -- you know,
24 perhaps the -- the author of this response was not
25 aware that we are treating it as a source, and it is
26 incorporated as a source in the assessment.

1 Q Okay.

2 A MR. HOUSTON: I think that, Mr. Secord, the
3 confusion might come from the question. I mean, we're
4 talking about extreme flood events. And so in extreme
5 flood events, the end-pit lake wouldn't create an
6 additional source of contamination, but we have
7 recognized in the modelling that seepage from the
8 end-pit lake can and does -- will occur.

9 But just specifically in the case of an extreme
10 flood event, it's not an -- you know, an additional
11 source under those circumstances.

12 Q So, Ms. Grainger, would you agree that it looks like --
13 looking at this figure that you pulled up, that the
14 travel time would be somewhere between zero to ten
15 years from the end-pit lake to Gold Creek?

16 A MS. GRAINGER: I don't think that's evident
17 on this picture. We can go back to 112 -- PDF 112,
18 which is the map which shows the groundwater travel
19 time --

20 Q That's the one --

21 A -- for creek discharge.

22 That is the one we were looking at this morning.

23 Q Okay.

24 A You're right.

25 Q Okay. So we don't need to go there, then.

26 A Okay.

1 Q All right. I'm going to pass over my questions on the
2 waste rock humidity salt test charts. You'll probably
3 be happy to hear that.

4 MR. SECORD: If we could please turn up PDF
5 page 251 in Appendix 10 in CIAR 42. That is not it.
6 251 in Appendix 10 of CIAR 42. There we go. 5.2,
7 "Groundwater Quality" at the bottom.

8 Q MR. SECORD: So it says: (as read)
9 Due to limited data availability, certain
10 parameters have not been analyzed for -- in
11 groundwater, including beryllium, bismuth,
12 lithium, molybdenum, ammonium, phosphorous,
13 tin, strontium, titanium, thallium, vanadium,
14 and zirconium. For these parameters, no
15 source term was included for groundwater, and
16 the concentration was assumed to be
17 0 milligrams per litre.

18 Mr. Day, are any of these elements considered toxic to
19 humans or aquatic life?

20 A MR. DAY: Again, I will have to ask
21 Martin to respond on that, please.

22 A MR. DAVIES: What -- what I can say is
23 that, you know, pretty much anything at -- at some dose
24 is toxic to something. Yeah. What -- what stands out
25 in this list to me: Most of these are metals that --
26 that don't receive very much attention in -- in

1 environmental quality studies. Ammonium does.
2 Molybdenum does sometimes. The others much less so, I
3 would say.

4 Q Okay. So would you agree, subject to check, that
5 ammonia -- how do you say it -- "molybdenum" and --

6 A Perfect.

7 Q -- and thallium, would you agree, subject to check,
8 that they have listed guidelines in Alberta for the
9 protection of freshwater aquatic life? Those are the
10 2014 guidelines marked as CIAR -- CIAR 849. Do you
11 accept that?

12 A Yeah, that sounds reasonable.

13 Q And would you accept that ammonia, molybdenum, and
14 thallium also have listed guidelines in the 2018
15 guidelines marked as CIAR 850?

16 A I believe that they do, yes.

17 Q When faced with no data -- maybe this is for you,
18 Mr. Jensen.

19 When faced with no data for chemical constituents,
20 is it common to use some percentage of the respective
21 method-detection limits, e.g. 50 percent, so that the
22 impact modelling can be done in a conservative manner?

23 A MR. JENSEN: I would say generally, yes,
24 I'd agree with that.

25 Q And why did SRK choose not to employ this common
26 approach in its impact modelling in this case?

1 A Well, Mr. Secord, as you were posing your questions,
2 I'm -- I'm just looking for the model 'cause our use
3 of -- of background water quality for groundwater is
4 very, very limited in this model. We only used that
5 particular input in situations where groundwater's
6 directly, you know, somehow extracted and then -- and
7 then, let's say, conveyed to another surface water,
8 another reservoir.

9 So in this case, whenever we have, for example,
10 quality of water that would seep from the end-pit lake
11 into Gold Creek at GC10 following a groundwater path,
12 we wouldn't be using this source term. And, in fact,
13 I'll have to get back to you, but I'm not 100 percent
14 sure if -- you know, exactly how much -- sometimes
15 we'll use easier -- easier -- "easier" assumptions when
16 we know that the source terms have absolutely no
17 relevance to the outcome of the model, and that's most
18 certainly the case here.

19 So I hope -- I hope that makes sense. It -- I'm
20 not excusing our use of -- of zero in -- in this case.
21 You know, we really don't expect there to be any
22 detectible limits of any of these -- well, for sure
23 ammonia -- the ones that matter -- in this groundwater
24 source, and most certainly loadings would be, you know,
25 not -- not measurable, really, in terms of the final
26 outcome. So we -- we don't -- whenever we do this, we

1 don't do it lightly. We always do it as an -- we don't
2 try and cut corners in that sense, except when it's
3 completely irrelevant to the outcome of the model.

4 Q Mr. Houston, I'm not sure who is best for this
5 question, but is it clear from the humidity cell tests
6 that when oxic conditions exist, selenium and other
7 harmful trace elements increase in concentration?

8 A MR. HOUSTON: Mr. Day --

9 A MR. DAY: Yes.

10 A MR. HOUSTON: -- would that be something for
11 you?

12 A MR. DAY: Yes. So I can speak to that.

13 Yeah, the humidity cells are a very useful
14 indication. It's a -- actually, why we perform them is
15 to understand weathering of the materials. So they are
16 a very useful indication of what -- what will come out
17 of them as they -- they get exposed to the atmosphere.

18 Q Right. So is it clear from the humidity cell tests
19 that are part of this application that when oxic
20 conditions exist, selenium and other harmful trace
21 elements increase in concentration?

22 A I certainly agree that selenium is shown to come out
23 when these materials are weathered, yeah.

24 Q And do you agree the success of the SBZs to sequester
25 selenium is dependent on the conditions in those
26 structures remaining anoxic?

1 A I agree that the option must be low. I -- I take issue
2 with the use of "anoxic". It's more like suboxic, but
3 low oxid conditions is correct. Yeah.

4 Q How will Benga ensure that the SBZs remain anoxic or
5 suboxic into perpetuity after Benga is gone?

6 A Well, the -- the -- the way that suboxic conditions are
7 created is using methanol, and my expectation is that
8 that would continue until those conditions can be
9 demonstrated to be sustained.

10 Q Now, a void ratio of 25 percent -- that's porosity, and
11 I don't think we -- I don't know if you need to turn it
12 up; the reference is Appendix 10, PDF page 249 -- was
13 used for the SBZs. Do you agree that -- would it be
14 fair to say, Mr. Day, that you would've expected that
15 this number would've been much higher, around
16 40 percent or so, given the volume expansion to the
17 excavated rock or maybe put -- or maybe --

18 A Yeah.

19 Q Or maybe put another -- maybe put another way, another
20 way to approach it is: What is the justification for
21 the selection of 25 percent? And if a higher number
22 had been used, how would this affect the mine water
23 balance?

24 (SIMULTANEOUS CROSS-TALK)

25 A MR. DAY: Go ahead.

26 A MR. HOUSTON: Okay. Mr. Jensen's going to

1 answer that, Mr. Secord.

2 A MR. JENSEN: Okay. Yeah. So the
3 assumption of 25 percent is another example of -- of a
4 conservative assumption we used. It -- it certainly is
5 low. It -- it's not outside the range of what you
6 might expect for -- for waste rock. But, you know,
7 in -- in certain cases, we are -- we're closer to 30,
8 and in other cases I'm aware of we're as high as 35.

9 25 just means that it gives us the least amount of
10 residence time and the least amount of -- of available
11 storage volumes within the -- within that -- in this --
12 the saturated backfills. So that means when we are
13 looking to evaluate mitigation measures and constraints
14 on -- on managing the volume of water, we're saying,
15 Okay. Let's say 25 percent -- that's the least
16 we would -- we would ever expect. So what does that
17 give us in terms of a volume? If we increase that
18 number, it just means we have more storage volume,
19 and -- and in terms of planning for mitigation, it's --
20 you know, I prefer to be conservative on that count.

21 Q And what was the void ratio selected for the waste rock
22 dumps?

23 A I believe it was 25 percent. Let me just quickly check
24 that.

25 Yes. That's correct.

26 Q So, so much attention has been given to selenium that

1 other harmful elements appear to be overlooked. Is
2 there a reason for that and, if so, please explain.

3 A MR. HOUSTON: I -- I don't know if that's a
4 fair statement, Mr. Secord. We've -- we've modelled
5 many elements that we believe will be present in the
6 treated water, and we have identified a few, like --
7 like zinc, for example, or aluminum, that may be
8 issues. Our modelling is conservative, and so -- and
9 the results are, in many cases, on the borderline. So
10 they -- they may be issues. If they are issues, we've
11 committed to installing a metals treatment plant to --
12 to deal with that. So -- so I -- I don't think it's
13 fair to say they've been ignored.

14 Q So dousing of the SBZs with an organic substrate will
15 likely have to occur to promote the reduction in redox
16 conditions necessary to precipitate and sequester the
17 selenium. Has Benga looked into how this will affect
18 the mobility of other harmful elements like arsenic,
19 chromium, cobalt, copper, lead, mercury, molybdenum,
20 and nickel?

21 A MR. JENSEN: Yeah. So our expectation is
22 that certain elements, in particular manganese and
23 possibly arsenic and -- and other metals that we --
24 that we know, tend to mobilize during reducing
25 conditions, so under reducing conditions. We're
26 keeping a close eye on those, and that's one of the

1 reasons that we have recommended our -- and Benga has
2 committed to two things. One is the -- the test work
3 at various different scales to try and -- and come to
4 terms with exactly what -- what concentrations or what
5 constituents might be mobilized. The other one is
6 the -- the post-SRF treatment that the company has
7 committed to.

8 So we are -- we are by no means ignoring the
9 potential for -- for constituents to be mobilized, and,
10 in fact, what's required on our end is -- is a little
11 bit better quantification of exactly which ones, if
12 any, will be mobilized so we can -- so we can manage
13 them appropriately.

14 A MR. HOUSTON: I think I'd just like to add
15 to that, Mr. Secord. I forget what verb you used for
16 the addition of the -- the hydrocarbon, which probably
17 will be something like methanol. But it -- it's a very
18 well-controlled amount of methanol we'll be adding to
19 this -- this SBZ. We want to create just the right
20 level of oxygen so that we reduce the selenium, we
21 reduce the nitrates, but we don't go so far as to
22 reduce other elements and -- and create problems. So
23 it -- it's a very closely monitored process.

24 Q All right. So I think I'd like to move on to this last
25 area of questioning. Monitoring conducted by Teck
26 Resources Limited, Teck, in the Elk Valley to the west

1 has identified the presence of elements such as
2 cadmium, cobalt, nickel, and zinc above guidelines for
3 the protection of freshwater aquatic life and
4 occasional detections of chromium and uranium above
5 those same guidelines. The same -- the same can be
6 expected for this project given the similarity of the
7 formations. So why would we create another problem in
8 an area -- in another -- why would we create another
9 problem area in another sensitive watershed of the
10 Rocky Mountains?

11 A Mr. Secord, first of all, we can't speak to the
12 situation at Teck. We -- we can only speak to the
13 project we've got in front of us. We've -- we've gone
14 to lengths to identify what are the potential
15 contaminants of concern emanating from the Grassy
16 Mountain Project, and -- and we've done our best to
17 model those in a conservative fashion and develop
18 mitigation techniques to -- to ensure that the
19 environment is protected.

20 MR. SECORD: Zoom Master, if you could pull
21 up Aid to Cross Number 4 Coalition, Elk Valley water
22 quality 2018 annual report. If you turn to -- first of
23 all, could you turn to PDF page 160?

24 Q MR. SECORD: Probably this is for you,
25 Mr. Houston. Would you agree, subject to check on this
26 figure, that the LC_WLC monitoring station is -- is

1 located in the lower left inset panel and basically at
2 the south end of the operation -- of the Teck
3 operation?

4 A MR. HOUSTON: I have to confess, I can't
5 read it at this scale, Mr. Secord.

6 MR. SECORD: Can you blow it up there?
7 The -- the -- the lower left inset panel? Go up. Up.
8 No. Go up on the document.

9 Q MR. SECORD: There's the lower left inset
10 panel. Can you see the LC_WLC?

11 A MR. HOUSTON: If that stands for West Line
12 Creek -- is that what you're looking for?

13 MR. SECORD: Don't move the document.
14 You're fine where you were. Just leave it there.

15 Q MR. SECORD: It's Line Creek WLC -- LC_WLC.
16 You see that?

17 A MR. HOUSTON: I -- I see that, yes.

18 Q Okay.

19 MR. SECORD: And if we could then go to PDF
20 page 85 -- sorry, 4858 in the Teck report. And if
21 you -- if you scroll down, please. Put it at
22 100 percent.

23 Q MR. SECORD: So you'll see there is a
24 line -- and this is probably for Mr. Day. There is a
25 line for the LW_WLC [sic] --

26 MR. SECORD: And can we go up to the top so

1 we can see the -- and is it possible to -- to get rid
2 of Mr. Houston's picture so we can see the whole
3 document? Can you move the photograph over? Why don't
4 you reduce it further to 75 percent.

5 Q MR. SECORD: So, Mr. Day -- I guess it's --
6 maybe I guess we'll need it at 100 percent.

7 All right. So on page 4858 -- and I've got my --
8 you've got it at, I guess, 100 percent, so that's fine.

9 But, Mr. Day, you'll see the very first entry for
10 LW -- LC_WLC under the heading "Cadmium", there's a
11 reading of .307; correct?

12 A MR. HOUSTON: Mr. Chair, there's a lot of
13 things going on at Elk Valley. A number of mines --

14 Q Just let -- just let me --

15 A Yeah. I just don't want to be -- I don't want to be
16 answering for, you know, another company here. That --
17 that's where I don't want to go, Mr. Secord.

18 Q Sure. Let's just take a look at the data, Mr. Houston.
19 Perhaps we can just go there first.

20 A Okay.

21 Q On page 8 -- on page 8 -- 4858 of this aid to cross,
22 for the first entry for LC_WLC, for cadmium, there is a
23 reading of .307; correct?

24 A Cadmium. I've got Cadmium D and Cadmium T.

25 Q Yeah. So for --

26 A .322 and .307.

- 1 Q So for cadmium -- for Cadmium T, it's .307. For
2 Cadmium --
- 3 A 'D', yeah.
- 4 Q For Cadmium D -- yeah, for Cadmium D, it's -- it's
5 .322; correct?
- 6 A Yes.
- 7 Q And then if we go to PDF page 848, so two more -- two
8 pages down -- or two pages -- yeah, two pages into the
9 document, so from -- so this would be 4860. We have
10 for mercury a reading of point -- this is in Mercury T,
11 a reading of .00111; correct?
- 12 A Where -- where are you reading that?
- 13 Q The first -- first line of LC_WLC for mercury --
- 14 A No.
- 15 Q -- we have --
- 16 THE CHAIR: I don't think we're on the
17 correct page anymore.
- 18 MR. SECORD: 4860.
- 19 A MR. HOUSTON: Okay.
- 20 Q MR. SECORD: So on the bottom, on the far
21 right-hand side of the document.
- 22 A Yeah.
- 23 Q Again, I don't know why the Zoom Master can't reduce
24 your screen picture, but there we go. There's a
25 reading of .00111; correct?
- 26 A I see that. Just above the dark -- darker black line,

1 the thicker black line, yeah.

2 Q That's right.

3 A Yeah. I see that, yes.

4 Q And then for -- on page -- so two further -- two
5 further pages in, so this would be 4862, we have for
6 the 'W' -- LC_WLC for Selenium D, 512 and 523 recorded;
7 correct?

8 A 512 and 523. I see the numbers, yes.

9 Q Yeah. And then if we go to PDF -- two more pages over,
10 so this would be 4864, we have, for the first entry for
11 LC_WLC, uranium at 19.9 for Uranium D; Uranium T, 21;
12 for zinc, 10.7 -- for Zinc D, 10.7; for Zinc T, 10.2.

13 A Yes.

14 Q Okay.

15 A Was there a question, Mr. Secord?

16 Q Yeah. I'm just going back to my -- my questions,
17 Mr. Houston.

18 And perhaps you'd accept, just to speed things
19 along, that that LC_WLC monitoring station -- it is
20 listed in Table 4 on PDF page 25 as receiving
21 environment West Line Creek. And we don't need to turn
22 that up.

23 A Yes. That doesn't mean much to me, Mr. Secord, but --

24 Q You don't know what a receiving environment is,
25 Mr. Houston?

26 A I do, but I don't know where these measurements are

1 taken. You know, I --

2 Q Yeah. What --

3 A This is not -- this is not my project, Mr. Secord.

4 Q Yeah. And what are the -- what will be the receiving
5 environments for the Grassy Mountain Project?

6 A So the treated water, after it leaves the SBZ and after
7 it leaves the -- the metals treatment plant, if -- if
8 we need to install one, will eventually make its way
9 into Blairmore Creek, only after it's been monitored
10 and measured and -- and that we've ensured that it
11 meets the requirements for return to the environment.

12 Q Has Benga assessed the risk that their operation might
13 have -- has Benga assessed the risk that their
14 operation might have on the concentrating and potential
15 release of NORM -- in capitals -- naturally occurring
16 radioactive materials, or TENORM, technically enhanced
17 naturally occurring radioactive materials, into the
18 local environment?

19 A No, we haven't looked at that, Mr. Secord. It wasn't
20 one of the risks that we, you know, assessed important
21 for the project.

22 Q Well, why not, when your neighbour a couple of valleys
23 over is showing high uranium levels at one of its
24 monitoring stations?

25 A Again --

26 Q Or do you know about that, Mr. Houston?

1 A No, again --

2 Q Is that a surprise to you?

3 A No. Mr. Secord, we're -- we're looking at the rock
4 that we're dealing with for Grassy Mountain. We've
5 done the testing on the rock to determine what metals,
6 especially, and -- and other elements could potentially
7 be released. I can't speak for Teck. There -- there's
8 five mines. They date back 30, 40 years or more. So I
9 can't speak to what the situation is for Teck.

10 All we can say is that we've evaluated the -- the
11 issues related to Grassy Mountain mine. Yes, where
12 we've been able to adopt technology that's been
13 advanced by another company, we have done so. But
14 we've done it based on what we've found at Grassy
15 Mountain, not what somebody else has found in a
16 different place.

17 Q Okay. So I guess what you can say is you haven't
18 looked at -- you haven't looked at all at the potential
19 release of NORM or TENORM, even though you're dealing
20 with exactly the same type of rock, Mr. Houston?

21 A We -- we're -- we're dealing with the rock from Grassy
22 Mountain. It's not exactly like anything. It's the --
23 the rock that we have for this project, and -- and
24 that's the basis for our analysis, Mr. Secord.

25 Q It's the same type of rock that Teck are mining. It's
26 a metallurgical mining rock; correct?

1 A No. I -- I think that's a super oversimplification
2 of -- of mining in general. We're -- we're -- we're
3 dealing with the rock on Grassy Mountain.

4 Q And how does that differ from Teck's rock?

5 A I -- again, I don't have a sample of Teck's rock. What
6 we do have are samples of Grassy Mountain rock, and --
7 and that's what we've been analyzing.

8 Q So it could be exactly the same as Teck's rocks?

9 A I don't have rock from the Teck project to compare
10 with.

11 Q Right. Okay. I think we've established that success
12 of the SBZs in sequestering selenium for the long-term
13 will be contingent on keeping redox levels low in those
14 waste disposal areas and in the suboxic range, as
15 Mr. Day puts it.

16 What will happen after the mine is complete and
17 reclamation is done? How will Benga guarantee that
18 selenium will not be mobilized later by infiltrating
19 oxygenated waters that will shift the redox conditions
20 into a conducive range?

21 A So -- so, Mr. Chair, as we've discussed many times in
22 this hearing, the -- the selenium will be removed from
23 the water through this biochemical process, and -- and
24 that will be at some depth within the SBZ to -- to
25 avoid possible minor variations in the level of the
26 natural groundwater.

1 So I -- I think we all can appreciate that even in
2 a -- a very deep end-pit lake, even though it's exposed
3 to oxygen at the surface, unless there is a mixing
4 mechanism, it's -- it's very common to have suboxic
5 or -- or low oxygen levels at depth, and it's simply
6 because the -- without the mixing of the water from top
7 to bottom, it's difficult for oxygen to -- to penetrate
8 to depth. So we -- we would expect that once the
9 selenium is deposited inside the waste rock saturated
10 backfill zone, that -- and -- and left to its own
11 devices, that the saturated backfill zone would not
12 reoxygenate naturally.

13 Q It is indicated that it may take a long time, 50 years
14 or more, for any contaminants mobilized by the mine
15 development to be detected at monitoring stations.
16 Benga will be long gone by then. So how can area
17 residents be sure that legacy contamination will not
18 become a problem for them down the road health-wise or
19 cost-wise? I'm thinking specifically of Ms. Gilmar and
20 her successors.

21 A Mr. Chair, I think what we've been discussing is
22 exactly the opposite. We're expecting to see the
23 selenium, nitrates, other metals during the life of the
24 mine. And what we've said is that we fully expect to
25 leave the water treatment facilities, some pumps,
26 monitoring stations, maybe even injection facilities

1 for -- for methanol -- we expect to leave that system
2 in place for a number of decades after end of mining,
3 and we expect to continue to operate and monitor the
4 water quality and the water management system until
5 such time as it's demonstrated that the -- the system
6 is -- is naturally reaching a safe level of water
7 effluent.

8 Q There is a lot of faith being placed in the SBZs to
9 attenuate selenium. The retention factors are quite
10 high at 95 percent -- that's in Appendix 10 water and
11 load balance model -- and it is likely that this
12 capture efficiency -- do you agree that it is likely
13 that this capture efficiency will be much less, given
14 some of the expected geotechnical complications, e.g.
15 pH, CO2 levels, redox conditions?

16 What would -- and then as a follow -- as a little
17 add-on to that 'cause I'm down to my last -- I'm
18 probably past my time. So as a little add-on to that
19 question, Mr. Houston, what will be the time lag
20 between when Benga finds out that the SBZs are not
21 working as planned and when suitable water treatment
22 can be deployed?

23 A Again, Mr. Chair, we expect that this system is going
24 to be slow in developing. Mr. Jensen talked about the
25 buildup time of -- to -- to get a minimum of water in
26 the ex-pit rock dumps so that we start to see

1 percolation of water through those rock dumps. And
2 then the SBZ itself, water selenium concentrations,
3 the -- the long duration of retention in the SBZ,
4 that's all a very slow system.

5 We have committed, should that start to show signs
6 of moving offtrack, that we would implement a water
7 treatment plant or a gravel bed reactor in parallel or
8 in series with the SBZ to take up the slack, so to
9 speak. We -- we think that a gravel bed reactor based
10 on the preliminary design that we -- we provided in one
11 of our IRs that we could install that kind of a
12 treatment facility in -- in a year, and that would be
13 provided that we do some additional planning and design
14 work in advance, but it would be about a year to put
15 one of those in and -- and probably longer in -- in the
16 two-year time frame or -- or -- or maybe three for a
17 water treatment plant.

18 Q Will enough water treatment capacity be able to be
19 achieved in the time needed to deal with the volume of
20 water, given what we know about the challenges faced by
21 Teck Resources in their Elk Valley operations?

22 A Again, very different operation. Mr. Chair,
23 Mr. Secord, we -- we like to think that we're -- and --
24 and Teck is moving forward and learning and -- and that
25 we're also learning along with them, and -- and we've
26 implemented -- we are implementing a number of -- I

1 don't know if I should call them "technologies", but
2 just practical measures in this mine to reduce the
3 amount of water that we have to treat and to deal with
4 the selenium issue from the ground up.

5 So -- so we're -- we're thinking this through from
6 the very start of this project. We're at the
7 conceptual stage now, but as we move into
8 engineering -- detailed engineering designs, timelines
9 will be developed that will be designed to deal with
10 the selenium issue.

11 Q Okay. And this is my last question, Mr. Houston.
12 Adaptive management seems to be the overarching
13 solution to contaminant issues that are not completely
14 understood at this point in time. Do you agree this is
15 a reactive stance, not a proactive one; and how will
16 Benga ensure that contaminants will be isolated from
17 the groundwater and surface water environments during
18 mine development and into perpetuity?

19 A I -- I don't think it's reactive at all. I -- I think
20 we're trying -- first of all, we're -- we're modelling
21 the -- the mine -- the project using conservative
22 parameters, trying to err on that side of the equation,
23 so that -- so that our predictions encompass an
24 envelope that is -- and that the project outperforms
25 the predictions.

26 The other thing I would say is that we've -- we've

1 planned in advance for a metals treatment plant or for
2 a backup selenium treatment plant. We -- we've done
3 some preliminary design on groundwater extraction well
4 systems. So we've thought through a lot of these
5 things. We've identified that these are all possible
6 solutions that we can employ practically on this
7 project if required. And so I -- I -- I actually think
8 that's a very proactive stance, and -- and I guess
9 that's the spirit of adaptive management or contingency
10 planning or -- or whatever you want to call it.

11 MR. SECORD: Mr. Chair, thank you very much
12 for extending me the generous time allowance, and I
13 will sign off.

14 I have to say this area is very complex, and I
15 probably could've used the initial 12 that I asked for,
16 but I appreciate these hearings have to have limits, so
17 I'm done. Thank you very much.

18 And thank you, Mr. Houston, and your witnesses and
19 the answers --

20 THE CHAIR: Thank you, Mr. --

21 MR. SECORD: -- they gave. Yeah.

22 THE CHAIR: Thank you, Mr. Secord.

23 Just one thing before you sign off. You and
24 Mr. Houston had a discussion earlier, and I just wasn't
25 quite sure it got resolved, and it had to do with
26 ammonia levels in Blairmore Creek at 2039. And you

1 were looking for a confirmation from Benga that those
2 levels exceeded the environmental quality guidelines
3 based on the Alberta surface water 2018 guidelines.
4 And I think Benga agreed to get back to you. I think
5 Mr. Houston was about to provide a response. You
6 indicated it was an undertaking. We don't actually --
7 didn't actually assign an undertaking, so I guess my
8 question for you, Mr. Secord, is that still a question
9 that you want Benga to respond to?

10 MR. SECORD: Yes.

11 THE CHAIR: Okay. And, Mr. Houston --
12 yeah, Mr. Houston, were you able to respond to that?

13 A MR. HOUSTON: Mr. Chair, if we could come
14 back to that first thing in the morning, I think that
15 would be the best thing.

16 THE CHAIR: Okay. So we'll get a -- we
17 will assign an undertaking number just to track it
18 until you respond.

19 A MR. HOUSTON: Okay.

20 THE CHAIR: So what would that undertaking
21 number be, staff?

22 MS. ARRUDA: It will be Undertaking
23 Number 18, Mr. Chair.

24 THE CHAIR: Okay. Thank you.

25 Okay. Yeah. It's quarter to 5, so I think that's
26 probably about as far as we can go today. So according

1 to my list, up next for cross would be Mr. Rennie, if
2 he has any questions for Benga, followed by Timberwolf.

3 Is there any other business we need to take care
4 of today?

5 MR. RENNIE: I'm here. Jim Rennie.

6 THE CHAIR: Yeah.

7 MR. RENNIE: I have a quick question as to
8 what time we will be starting tomorrow morning.

9 THE CHAIR: Yeah. We will be starting at
10 9 AM tomorrow.

11 MR. RENNIE: Thank you. That's good.

12 THE CHAIR: Okay. Thank you, Mr. Rennie.

13 Anything else?

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

15 THE CHAIR: Okay. Have a good evening,
16 everyone.

17 MR. SECORD: Yeah. Thanks.

18 THE CHAIR: See you tomorrow morning at
19 9 AM.

20 _____
21 PROCEEDINGS ADJOURNED UNTIL 9:00 AM, NOVEMBER 18, 2020

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1 CERTIFICATE OF TRANSCRIPT:

2

3 I, Christy Longacre, certify that the foregoing
4 pages are a complete and accurate transcript of the
5 proceedings, taken down by me in shorthand and
6 transcribed from my shorthand notes to the best of my
7 skill and ability.

8 Dated at the City of Calgary, Province of Alberta,
9 this 17th day of November 2020.

10

11

<Original signed by>

12

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14 —
Christy Longacre, RPR, CSR(A)

15 Official Court Reporter

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