

Landslide and Avalanche Hazard Public Meeting – Transcript from [Landslide and Avalanche Hazard Public Meeting – Question and Answer Session - YouTube](#) – July 21, 2021

(edited to remove filler words such as “um,” “uh,” “you know,” “right,” “like,” etc.)

Provided by Tetra Tech Inc.

00:06 Teri Camery:

Thank you so much for that. I really appreciate those detailed presentations. I'm going to pass it back to Alix Pierce, Planning Manager, for just a minute, to explain the Q&A portion of our meeting. We're a little bit behind schedule but we'll get through as many questions as we can before we wrap up.

00:28 Alix Pierce

Thanks, Teri. So, I have asked a couple times that people put their questions in the Q&A and, again, if you're calling in from a phone, press star 9, and we'll take your question over audio. I see that Alan has done some good work of answering questions during the last presentation, which is great. I'll probably just read those at the end so everybody can hear. And we're going to upload the presentations and a recording of the questions and answers to the website so that people have that information in the future or, if you know anybody who wanted to attend this meeting but couldn't, they can look at that information online. So, we have 33 questions and, like Teri said, we'll try to get through all of them.

01:28 Teri Camery

Okay, Alix, I'm going to jump in and just remind you we're going to add Tom Mattice, CBJ Emergency Services Manager onto the panel if he's still online somewhere.

01:41 Alix Pierce

Yeah, I actually had just clicked “promote to panelist” on time, so good timing. There he is. So, I'll direct the questions to the appropriate person to answer. So, starting at the beginning we have – hi Tom.

02:12 Alix Pierce

[Reading question] It appears a tiny corner of my property is in the severe landslide zone, but most of it is not in the landslide or avalanche zone. Does that mean the whole property is considered to be in a severe zone? Does it matter if the dwelling is in or out of the zone? Teri, I'll let you take that one.

02:31 Teri Camery

I think we'd have to look at the specific wording of the regulations. I think in general the answer to that is “yes” – that if the severe avalanche designation applies to any portion of the project, of the property, then the development restrictions would apply. But I would prefer to double-check the wording on that regulation before I give you an exact answer.

02:54 Alix Peirce

And, again, we're available to answer questions directly via email or phone about people's specific properties but we don't have, quite have the staff capacity to search through every map and determine whether people's properties are on or off the maps. But if you do have questions about how it directly impacts your property and you know it's on the map, then please contact us.

03:25 Alix Pierce

So, we have questions about how this will be posted to the internet. We'll post the presentations and the recording of this question and answer.

03:39 Alix cont'd

So, then we have [reading question] Shall we assume the outcome of the current work is a cumulative map of hazards? 1987 remains, but new work is added?

And I'll take a first stab at this one. This is an entirely new study, so we didn't – the 1987 study provided the study team with one of the many data sources that they used and considered, but this isn't an update or an addition to that study. Does anybody, Alan or Vlad or Rita, do you have anything to add to that?

04:18 Alan Jones

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I could add something to that I guess. One of the challenges – one of the big challenges, of course, is taking all that previous information which was done by very experienced experts as well and bringing that into the modern world, because we're dealing with a completely different database. This LiDAR imagery and topography was phenomenally good and phenomenally accurate, and we were taking old lines done on by hand, essentially, a lot of these things, and trying to bring these into the modern world. So, we did a lot of overlaying of previous information, which didn't overlay very well, but we tried to consider it as best as we could, because these people were very good experts that were able to – and that's what I say – in my presentation, I was saying 1972 Frutiger's work, there was really good work that was very similar to some of the work that we did as well and you'll see in Behrends subdivision, some of the old work was really quite accurate as well, if you could put it on a modern topographic base, which is what we tried to do as best we can.

05:25 Vlad Roujanski

I would like to add also to that, Alix. We certainly relied on the previous mapping efforts. They were based on the – at that time – available air photos, surficial geology, and reports, and so on. This time, we used the high-resolution air photos and available LiDAR data, which we converted into hillshade models – bare-earth hillshade models, and which tremendously assisted with our mapping effort. We used in-house software, PurView, which is an add-on to ArcGIS, that allowed us to view three-dimensional air photo images, allowed us to zoom in and zoom out to check on some fine features which were not available for previous mapping. So, our mapping is done at the really high-resolution level and, of course, our interpretation includes results of previous mapping, but we managed to advance the theory behind it.

07:16 Alix Pierce

Great, thank you.

07:26 Alix Pierce

So, we have [reading question] Why were the green areas excluded?
I believe maybe that's a question for you, Quinn, with the overlay maps.

07:36 Quinn Tracy

Okay. So, I think, the green areas are low hazard and, I believe it's low hazard isn't anything we have in our regulations so it's – maybe Teri can help answer this. We're basically just looking at moderate, high and severe, so...

08:05 Alan Jones

Actually a lot of those green areas, I believe they're the – are you talking like the stuff down in the valley bottom, like in the Gastineau Channel, or the stuff at the top of the ridge? Because I think some of the stuff at the top of the ridge was just a different definition of that study area versus, say, things out in the Gastineau Channel, right where avalanche mapping was done, you know, a thousand feet out into the channel, and then there was just a decision to cut it off at some point in the channel.

08:33 Quinn Tracy

Yeah, okay. So, we're talking about the fourth map I showed. For some reason, I was thinking about the landslide map and the low hazard areas. So, if you look at the adopted hazard maps, they're basically – the hazard boundaries are these lines that are perpendicular slope and they just go out into the water and imagination about where the avalanches end and landslides might end or how they might behave in the water. So, the adopted hazard maps show, I think it was a moderate hazard, into Aurora Basin. So, I just wanted to show that, just leave it there because there is infrastructure there – there's docks, and there's boats. So, I just wanted to make sure I [included that]. Hopefully, that's the answer.

09:31 Alan Jones

I think this sort of speaks to it – the map here – I'll just show it there. It's just easier to talk with the area shown. So, I think maybe Teri, you could, or Alix, you could talk about the – I think it's really this green area here, and these are upslope areas where the – we actually ended up defining the study area – I think we redefined it at the beginning to follow the topographic divide up at the top of the mountain side. I think that's essentially what this was. Teri, maybe you could speak to that.

10:06 Alix Pierce

Yeah, that's correct, we had a different definition of the boundary, and the more recent one was based on top of slope.

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10:14 Alan Jones

Yeah, and then similarly out on the water, this is an example of something that was mapped artificially out into the middle of the channel, so you can see the difference here is now our avalanche boundary of the Behrends path extending out into the channel, but not in a rectangle out in the middle of the channel.

These green areas here are - this is Maria Hill, so this is actually a low hazard area at the top of the hill and this is a low hazard area out in Gold Creek, I think. So, hopefully, that explains most of those differences.

10:48 Alix Pierce

Thank you. So we have another question saying – it's a two-part question and I will take the second part. [Reading] Part one - Why are the new avalanche and slide area boundaries different and, number two, will CBJ be re-evaluating and or lowering taxes on properties that have been added to the new maps?

The answer to question two is, “not right now.” And we have – there's a whole regulatory conversation coming next year. We don't know what the impact on the real estate market will be from this, and this is kind of a baseline. We have these new maps, and then more work starts on how we use them in a regulatory way. So, we don't know what that means in terms of properties or insurance or home assessments or tax assessments or anything along those lines.

And, as for why the boundaries are different, maybe Alan or Vlad could take that.

12:14 Vlad Roujanski

Sure, I can - I can talk about it. As I mentioned already, we used high-resolution air photos and satellite imagery, and we interpreted it using our PurView ArcGIS-based software. So, all those high-resolution air photo images on the computer screen, they were in spatially accurate locations. So, we analyzed historical air photo records, each of those – even old photos – air photos starting from 1949. They were accurately located, so mapping was completed for various air photo years with a high level of confidence in the location of the various landslide-related (or probably avalanche – Alan can talk about that as well) – high level of those various features, high confidence in how we map, how we located those features. So, the level of accuracy is considerably higher for this study than for the previous studies. That's pretty much all I want to say.

13:46 Alan Jones

I could follow up on that, I think. I'm not clear exactly on the question. It's got two takes. Why is it different from what was mapped before? I think Vlad explained that. And then, also in terms of avalanches versus landslide hazards, I mean, they're completely different processes, so, of course, they're gonna have – they follow different processes, in terms of debris flows gonna go one way and an avalanche is gonna flow a completely different way. So, it's important to keep in mind that the landslide mapping considers a whole bunch of different types of hazards: landslides, debris flows, rockfall, whereas the mapping that I did is just strictly avalanche hazards. So they're going to have just by virtue of topography and the hazard process, they're going to be different. I think that's probably - I think that might be what the question was talking to or my interpretation of it.

14:44 Alix Pierce

Thanks, Alan. So, we have this [reading question] Does the study area include anything past the rock dump?

I can take that. It goes just past the rock dump to the slide path, the Thane slide path that we all know well and extends just beyond there.

15:09 Alix Pierce

So, the next question is [reading question] Is there someone we can speak to about how conclusions were reached about specific hazard designations around specific properties? There's an avalanche zone depicted above my house and I am not aware of there ever being any potential avalanche risk in this area. [G000]

I will start that and then maybe Alan can pick up because he's the avalanche expert.

15:33 Alix Pierce cont'd

But we didn't – the study did not pay any attention to property boundaries in how the avalanche and landslide zones were mapped and determined. We, the study team, intentionally looked at the risks and mapped the risks and then property boundaries were overlaid after, so with the intention of getting an accurate picture of what the risks are in the Juneau area without kind of adhering to hard and fast property lines, which in terms of avalanche or landslide risk are kind of artificial.

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16:25 Alan Jones

And I can follow up on that a bit... exactly as Alix says, we did our work completely independent of not only property boundaries but also infrastructure, whether there was a building there, or a road there, or whatever, it was done with our interpretation, our modeling, and all the different techniques that we use; as much as we can be agnostic to what's there. So, if a line goes through the middle of the house, it's not something we even thought about; it was something that was applied. And, certainly, I think Quinn pointed out earlier about hazard boundaries following property boundaries in the old days, and there was actually a school of thought with mapping not that long ago, and you'll see a fair bit, especially in some of the U.S. counties in Colorado, there's avalanche mapping that follows property boundaries and zigzags through towns. I've seen lots of examples of that. That's not considered current best practices, so we do our modeling because that could change. You could also have a house move, or you could have a house be destroyed by an avalanche and there is some arguments, some areas where, say, a large hotel might actually protect houses downstream and there has been this sort of work demonstrated in some countries but we didn't even go there at all with this study and it wasn't really the intent of the study.

17:56 Alix Pierce

Thank you. So, we have [reading question] Was the history of how the slide areas have moved taken into account? I've watched the White area move for over two decades and it's changed substantially.

I believe Rita answered that question in her presentation by showing historical photos of where things have moved but, Rita or Vlad, do you want to expand on that at all?

18:22 Rita Kors-Olthof

Sure. With the historical perspective from using all the different years of aerial imagery, like including the air Photos, including the LiDAR, and including satellite images, that allows us to get a perspective of what is happening to a slide area, and very often it won't be in exactly the same area every time because every time a slide happens, it may dump a bit of debris along one side, and it'll be pushed over to the other side next time around. So, there is going to be a certain amount of natural variation in where those slide paths actually end up. So then, the most important thing is to look at where the boundaries have been and where they potentially can be again.

19:07 Alix Pierce

Great, thank you, Rita. So, our next question [reading question] Is the intended public benefit of this work to prevent loss of life and property by (a) preventing new building in the designated hazard areas, or in areas designated as above a declared limit, and/or (b) to contemplate evacuating presently-occupied areas?

I'll let Tom take the evacuation part of that question. Our intent with this has never been to permanently remove properties that are presently occupied. It was to accurately map the hazard areas in Juneau and then, in a follow-up process, to do a regulatory – some work on our regulations – which, as we said, is coming next year. So, right now in High and Severe avalanche and landslide areas on the existing or currently adopted maps you can't add density in High or Severe areas. So, that doesn't mean that if your house burns down, you can't rebuild it. But it does mean that if you wanted to add an accessory apartment to your house, you wouldn't be able to. Or, if you wanted to build a new multi-unit structure, you wouldn't be able to. If you wanted to subdivide your property, to add another lot to build on. So that's kind of a very broad brushstrokes description of our current regulation but as we work on the regulatory piece of this, we'll use these maps to kind of help guide the community conversation around that.

21:27 Tom Mattice

And truly the goal was to define the problem as clearly as we could. We knew that the old maps were combined of landslide and avalanches and we knew the characteristics weren't the same. And we just needed for insurance purposes as well, to be able to clearly define what kind of a hazard zone are you in, so if you insure for the wrong hazard either... So, but not only were we looking at that, but the original request actually, partially from the Lands department, in hopes to be able to understand CBJ lands as well, and be able to potentially open more lands for development as well. So it's important to recognize that we were looking along the way.

22:08 Alix Pierce

And Tom makes a good point, there's a lot of public property affected here as well, and we wanted to know about that.

22:16 Alix Pierce cont'd

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The next question is [reading question] Can this assessment be done for the complete Juneau road system before new designations are adopted for just the downtown area for a more comprehensive and comparative analysis?

And I'm going to throw that one to Teri.

22:36 Teri Camery

Okay, I think my response to that would be “gosh that's a fantastic idea,” but I don't know where we're gonna get the money. We were very fortunate to get this grant from the Federal Emergency Management Agency. We did present them with four different priority areas for study. We've received a number of questions from people in other areas of the community really wanting information on the landslide risks in their particular neighborhood. We would love to be able to do all of these areas, but certainly we've established downtown Juneau with its known risk and established development as our first priority for getting an updated study and we will move along to other areas as soon as we're able and as soon as we can obtain funding.

23:28 Alix Pierce

Thanks Teri. [reading question]

In Tetra Tech's experience with mapping hazard areas in other communities, what were the impacts to property owners, for example, loss of value, home insurance, and lending? Also, what were the local government's responses to the property owner impacts? What is CBJ's plan moving forward for impacted property owners?

So, I'll let the Tetra Tech team start and then I can answer the CBJ portion.

24:00 Vlad Roujanski

Rita, probably Fort McPherson would be a good example. Can you say anything about that? We have community mapping there.

24:12 Rita Kors-Olthof

Yes. We have recently looked at a couple of different communities in the North where slope stability has been an issue, and they were aware to begin with that some of their buildings were at risk and they wanted to know more about it. So that's the approach that's been taken. Now, in those cases, they're fairly small communities so there is a very strong push to try to have local input into how to deal with those slope issues and, in some cases, if it's considerations of whether buildings can be moved, or the sort of time frame that would be considered at risk, like in both communities that we did recently, there are buildings that are at the top of a slope where the slope is moving back or retrogressing and so that the houses are in danger of falling in the river. So, that's not quite the same as what we're looking at here, but there's probably some parallels. And there, at the same time, we looked at putting in lines that that would show them where the so-called “safe” line was, like a setback line that could be good for 30 years or 50 years. Now that's a little bit different from here in that you're looking at bottom-of-slope rather than top-of-slope, but you could apply similar sort of planning to that.

25:40 Rita Kors-Olthof cont'd

And ideally you would be working with ground that had never been worked, like some of the places that we worked, for communities that are opening new subdivisions, and that is something that you could consider here too. If you're going to have a new subdivision, that you can do that amount of planning to make sure that you aren't developing into areas that really shouldn't be developed into. Of course, you have more challenges when you've got these very steep ground areas that are already developed and that's something that really the community and the administration, like the CBJ in your case, really have to work with the community to figure out what the plan should be.

26:28 Alix Pierce

That's a great segue into what I was going to say, that that's our next step, is to work on our landslide and avalanche regulations through – we have a separate grant from FEMA to do that work. That work is coming in 2022. Right now, we have these new maps and we have this new information, and we want to share with the public and have accurate information out there, and then, moving forward, we'll work on the regulatory framework and what that means for property owners. But, right now, the changes are that properties that have been added to the Severe or High hazard zones are the restrictions on adding density. In the future, we'll know more about the impacts on private sector considerations like the real estate market or insurance, and we'll do a focused study on updating our regulations.

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27:56 Alix cont'd

So, our next question is [reading question] Maybe they should have spoke to the people who live there. The maps are not accurate.

Somebody from the project's team who was out in the field want to take that?

28:12 Alan Jones

I guess I can talk to that. There definitely wasn't enough scope and time to talk to all the residents out there. Certainly, we had good discussions with local experts, reviewed massive amounts of data, massive numbers of reports, a very large amount of modeling and analysis with world class experts, so I'd say that as far as the work, I can say they're as accurate as they could possibly be, given a very complicated location and possibly one of the most complicated urban avalanche settings in the world. So, I think we definitely have talked with people. Unfortunately, I can't talk with all the residents of Juneau in the amount of time, but thanks for calling.

29:05 Alix Pierce

Tom, you've probably talked to more property owners about this than anybody, so, do you have anything to add?

29:12 Tom Mattice

No. It's a difficult thing when you talk about our history and our knowledge. I was fishing in Yakutat last month and the biggest flood ever, but they had a 30-year flood history. Well, here we're talking about the biggest avalanches ever and we have your avalanche history when we're talking about 300-year avalanche. It's really hard to clearly say we have any idea what a 300-year event looks like.

29:37 Alan Jones

Yeah, and we had a question earlier there too about somebody saying "I've been in my house for 50 years and I've not seen anything." And then I looked at the data and, well, actually, the neighbor on one side, their house was severely damaged, the house that they're in was moderately damaged – this is in the 1962 incident avalanche that reached tidewater – and a couple houses across the road were also severely impacted. So, I think, further to Tom's comment there, we're – as humans – we have pretty short lifespans relative to what we need to map, right? So, the best we can map, typically, with this type of work that we do, is about 100 years. So then what we do, is we take a 100-year return period and we project that with modeling, with expert judgment, to come up with something that may happen in a 300-year time period and, of course, our lifespan and our things that we can observe are on the order of 50 years. Places like Norway, they actually use thousand-year return periods, for their mapping their hazards, which would result in even being more conservative. So, I think it's just great to keep in mind that that's what we're mapping is 300-year type events, and Vlad or Rita could talk to some of the geohazards – typically, those are even longer, right – some of the timescales of deep-seated landslides and things like that.

31:04 Tom Mattice

I would also just like to say that I'm not a landslide expert by any means but, in terms of the input parameters they used for the models for avalanche, they were very conservative. They used 6.6 meters of snow, I believe, was the highest avalanche depth, and this winter – excuse me, six *feet*, and this winter, we had avalanches that were significantly larger than that within a five-mile region, multiple times. So, they're really – we've seen much greater size avalanches in a short radius, and I feel the model inputs were very defensible and very conservative.

31:42 Alix Pierce

Thanks. So, it's almost the scheduled end of this meeting. We have a number of more questions. Is the project team okay to keep going, so that we can make sure that we're addressing the community questions?

31:55 Alan Jones

Yeah, I'm happy to stay on. I think this is great. It's really nice to get that feedback – further to that last question, we get a chance to actually communicate with the community and the neighbors, so I'm happy to stay on and answer questions.

32:08 Vlad Roujanski

Sure, me too.

32:10 Rita Kors-Olthof

I'm happy to stay too.

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32:14 Alix Pierce

And we are recording this question-and-answer period and we'll post it to the internet as well, so that people who weren't here have the opportunity to maybe get some of their questions, so I think this is really valuable.

32:32 Alix cont'd

So [reading next question] On the new GIS based hazard maps that Quinn showed us... how interactive are they? In other words, can I select a parcel by CBJ ID or street address, zoom into the parcel, and see lot dimension and orientation area as well as adjoining lot and structure data and street ROWs, locations, sewer and water lines, etc.? Quinn?

32:57 Quinn Tracy

At this point, no. Maybe in the future, we could add those hazard layers into an interactive map, just to make it easier for people to search their property – that's an option. As far as adding an interactive map with those additional layers like sewer lines, things like that, even the property lines that we have in our GIS, they are not survey quality. What's important about these hazard maps is the underlying imagery and the underlying LIDAR, which is referenced to survey points. If you take the hazard maps, and you remove the underlying imagery, you

have these hazard boundaries, and you have nothing to reference those to. So, the most important thing is to include the imagery along with the hazard boundaries. The survey lines with the maps in the Tetra Tech report are mostly just for general reference – it's easier for people to identify their properties and also where the streets are and things like that. But, as far as putting together an interactive application, that's something we could look into.

34:13 Alix Pierce

I think I'd add – and say that – if the assembly adopts these maps, that's something that we could move forward with.

So, next question is – and this is probably a question for Vlad, Rita, or Tom – [reading] Everybody has Haines on their mind when it comes to landslides. Could the terrain of Mt. Roberts and Mt. Juneau release a catastrophe like that, or are we primarily anticipating landslides that are immediately correlated with high rainfall and erosion? Is there a meaningful distinction?

34:57 Rita Kors-Olthof

Maybe I can handle that one. To me, those two questions are really the same question. I don't think there's a distinction between the two. Like the events that we saw from the historical studies on Mt. Roberts, those all seem to be associated with water one way or another, and with excessive rainfall, and big storm events, and so on. And that's what happened with Haines and that's what happened with the debris flows that we saw recently in Juneau on December the 2nd. So, to me, that's kind of one and the same question. Definitely, it is something that could happen in Juneau too, and that's something why it's really important to know what you're dealing with and where your trouble spots are.

35:48 Vlad Roujanski

So, at the same time, we – Rita – mentioned that we have this potential deep-seated failure, which probably is not related to water. And maybe *freezing* of water in some of those structures in the exposed rock, which basically widen and add to the instability – but that is a different type of geological feature, which, in our opinion, are quite unstable and requires further investigation.

36:35 Alix Pierce

Thanks. So, this next question is really specific, about a specific property. So, I'm going to read it, but I think that it might be more useful to have – Deb, we can reach out to you directly and talk about your specific property.

[Reading] I have questions regarding the specific landslide hazard map on page 82 of the draft landslide maps and how the lines were drawn. For instance, our property backs up to CBJ hillsides and we're considered high hazard while our immediate downhill neighbors are in severe hazard zone. On the surface, this makes little sense to me. Note our house was hit with trees from a landslide in November of 2020. Please advise on appropriate forum for this type of question if not on here.

So, an appropriate forum – send us an email, but we can do our best to answer it generally here... does anybody...?

37:42 Rita Kors-Olthof

Maybe it would help just to have a better idea exactly where that house is – is that on Starr Hill?

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37:55 Alix Pierce

I would assume so, but I think we should probably just answer that question directly.

38:08 Rita Kors-Olthof

Yeah. Yeah, if we can find more information about it, the exact location, then we can look at the mapping in that zone.

38:19 Alix Pierce

Great.

38:21 Alan Jones

I think it is Starr Hill, because page 82 just really shows the residential areas, just really shows the upper part of Starr Hill.

38:30 Teri Camery

I'm sorry to interrupt. My request would be that that person sent me an email directly and we can take a closer look at it from there. I was going to post my email again, but I can also just say it out loud briefly. It's Teri – t-e-r-i dot Camery c-a-m-e-r-y at Juneau dot org. If you send me that more specific information, we can follow up with you.

38:55 Alix Pierce

So, this is a lengthy question that I emailed to you all earlier about. [Reading] Quinn Tracy's maps and Tetra Tech's summary is clear, but the accuracy of the maps is a serious problem. Specific to the landslide hazard mapping portion of the study, there is no indication of any modern landslide modeling techniques. The references cited are over 30 years of age. Clearly efforts were focused on simply using a combination of old landslide maps and new LiDAR. Modern landslide evaluations include statistical models and – in parentheses – calling this a statistical effort is inaccurate – and physically based models. Many models are used in the Pacific Northwest and Alaska and could have been used in this study. Technically sound scientific examination of landslides including debris slides and debris flows would include analysis of hydrologic contributing area and evaluation of the sediment volumes and initiation and runout zones. An understanding of these parameters would aid in the understanding of landslide runout. My question to CBJ: will you add modern landslide modeling to serve the community of Juneau?

40:10 Vlad Roujanski

Well, Rita, I would like to start and maybe you'll follow up on that. Well, first of all, I disagree that the accuracy of our mapping is a serious problem. That is, I totally disagree with this statement, and for the reasons I already discussed previously. Our analysis, first of all, we did this terrain analysis, and it's based on very accurate interpretation and mapping of high-resolution latest data available. Yes, we haven't done modeling, but that's a different approach. We did conduct the semi-quantitative analysis, which is in our report. We compared various parameters against those hazard designation categories – the hazard designation categories we identified during our study, and that's quite – I'm not going to go into all the details and results of that semi-quantitative analysis – but they're quite interesting and they helped us to refine our mapping. Rita, would you like to add something to that?

41:53 Rita Kors-Olthof

Sure. It's not true to say that we just used the old landslide mapping – that wasn't the case at all. [It was] basically starting from scratch, looking at all the different years of air photos and other imagery, and applying those to the mapping, and along with some field confirmation of the mapping areas and correcting mapping with the information that was provided to us or that was observed in the field. The main contribution of the old reports was basic information. Well, what did they find out, you know that there's no point and no help to ignore the old information. They may have been able to see something that wasn't available for some reason, just give some historical background to the problems that they encountered at that time, and just comparing notes. It's always good to see what came before, but to say that that has a negative effect on somebody's mapping in this day and age – that's not true.

43:01 Alix Pierce

And Teri, maybe you could speak to the review that this went through, with experts from other agencies.

43:15 Teri Camery

Thank you, Alix. We received our first draft of the report back in August 2020, and we sent it out to about 18-20 local experts and other experts with FEMA, and State of Alaska – a wide variety of experts with just

tremendous background in both landslide and avalanche. And we did receive extremely detailed comments back, and we sent Tetra Tech about a 30-page list of detailed revisions. So, it got a very thorough vetting from local experts with detailed knowledge of Downtown Juneau conditions, and Tetra Tech made revisions from there. But a lot of it – a lot of those revisions – were just providing more explanation. The scientific analysis really did hold up to scrutiny, it just needed some changes in presentation. And then, Tetra Tech came back with a substantially revised version that was written differently but, again, the science was considered to be rock-solid from the very beginning.

44:44 Alix Pierce

Thanks, Teri. So, the next question is [reading] Why did the study stop in the middle of the “middle” path?

45:01 Teri Camery

I could give that a shot, but maybe Quinn can jump in too, and Tom as well. When we were first developing project areas with our grant proposal, we took a hard look at the areas, both with the highest hazard, the areas where we're looking at new development. We considered the blueprint, Downtown Juneau zoning effort, we looked at old studies. I can't speak to exactly how we drew that line there, but I can tell you it was a pretty rigorous internal review process with Tom, Quinn, CBJ Engineering, CBJ Lands, to determine that boundary. I hope that's helpful.

45:52 Alix Pierce

Thanks. So, we had another question that was [reading] Why was this area of Juneau chosen to be studied? There are many areas of Juneau that experience avalanches and landslides.

And I think Teri answered that earlier with “This is the area that we got a grant for and we would really like to study other areas as we're able to be funded for it.”

46:17 Alix Pierce cont'd

[Reading question] Is reforestation with anything useful as a preventative?

Alan or Rita want to take that?

46:29 Alan Jones

Yeah, I can talk from an avalanche perspective. Certainly, reforestation does help, particularly with starting zones, right? So, if you can reforest the starting zone and you can prevent the initiation of avalanches, that typically can help. Reforestation in the runout zone – if a path gets to a certain scale, avalanches – large avalanches – can just destroy and take out mature forests, so it's got sort of fairly limited potential, I think, for this area, just because of the nature of the terrain. You could certainly see some areas have grown up over time. At the northern end of the study area, there was certainly a number of those paths that previously ran in fairly open forests that have grown up over the years, but there was clear evidence also in the field of avalanches traveling – like destructive avalanches traveling – through mature forests, and not actually taking out the trees. So, these are avalanches that don't knock over hundred-year-old trees but could take out a wood-frame structure, for example. Let's say it does have some benefits but, overall, I don't think it's the solution for this area from the avalanche perspective. Rita, do you have any comment from the landslide side of things?

48:07 Rita Kors-Olthof

From a landslide point of view, it really depends on the kind of landslides we're talking about – if it's something very surficial and erosion kind of triggered events, and maybe less than a couple feet deep, then planting might actually help. But, if it's a more deep-seated type of landslide or if it's a deep debris flow, you might find that whatever you planted is just going to get ripped out because some of those events can rip out completely forested, mature forest areas too, just like avalanches can. Maybe it's an idea of looking at so-called starting zones and seeing what can be done in those kinds of zones but sometimes there's not a lot you can do without a real major engineering effort

49:03 Vlad Roujanski

And the mitigation of the landslide hasn't been in the scope, so we haven't really thought about all those mitigation options, but there are various options which can be applied, including the reforestation, of course.

49:30 Rita Kors-Olthof

Yeah, it's always one of the things that gets considered along with the engineering solutions.

49:38 Alix Pierce

Q&A Transcript from YouTube – July 21, 2021

So our next question is [reading] We own a property that has gone from no slide hazard to severe slide hazard. – And I believe this is Starr Hill because that's the area that was affected by the landslide maps in that way. – What are the reasons that would lead to this change? Were properties inspected on the ground?

50:05 Rita Kors-Olthof

It could be a matter of the amount of detail that was available from the new mapping, just because you can zoom in so closely and see a lot more from the imagery and also tie down the locations so much closely – much closer than they were on the previous mapping. So, first of all, the mapping capability is a lot higher, and then, second of all, if it's Starr Hill, there was a traverse done around this property, around that subdivision, so there were some pretty clear indicators of the kinds of hazards that were there. Now, of course, we don't know exactly which property this is that's being referred to. It's not possible to visit every single property but you get a general idea of the terrain around the area and that did definitely point to some problem areas there.

51:01 Alan Jones

I could speak to the field work there a little bit too, from both, perhaps for Shane, who's completed that, and myself. Certainly, there was quite a bit more emphasis in residential areas and areas that are built up with properties I know you know spent time with Shane walking – sometimes we're independent, sometimes we're in the same areas, but even though our mapping was done independent and agnostic to the fact that all these properties and buildings are out there, we just know that there's, of course, can be a higher level of scrutiny anytime that you're putting lines on maps near that affect people's properties and go through them. So, I know for my work, I know there was a much greater density of observations and time spent in things like the Behrends and the White and all these subdivisions with lots of houses, and I know Shane spent a lot of time in those areas as well.

52:00 Alix Pierce

Thanks. So, this next question [reading] At a landslide presentation a few years ago it was thought that there had been no major changes since the last assessments. I argued that areas such as above the White Subdivision had had much large tree growth occurring and that it was in mainly thin ground cover areas lying on steep bedrock. Do you think topping or cutting those areas would be advisable or would it be detrimental?

Rita, do you want to try to take that, or Vlad, about whether topping or cutting trees would be a mitigation measure?

52:42 Vlad Roujanski

I disagree with that.

52:45 Rita Kors-Olthof

Yeah, me too.

52:46 Vlad Roujanski

Cutting the trees that's totally – has totally opposite effect so...

52:57 Rita Kors-Olthof

Yeah, I think you might find that you've bit off more than you can chew, because if you're starting topping Trees, you're opening them to the possibility of injury or attack by insects and rot, and I don't really see that as a solution. Unless there are very specific locations that might be amenable to that, but as a general solution that – I don't really see that as a one-size-fits-all.

53:31 Alix Pierce

All right, thank you. So, the next question [reading] We live at 414 3rd Street. There has not been a big snow avalanche near our house in all the years I've lived in Juneau, over 50. During the heavy rain in the last few years more sliding is occurring above and along the 3rd Street stairs. What is CBJ planning to do about the possibility of slides from above us that may be caused by climate change, for example, above 6th Street and on the old Mt. Roberts trailhead.

I would say that having accurate maps is the first step and I don't know if Tom or Teri want to pick that up and continue

54:15 Tom Mattice

Hazard mitigation is a difficult thing – the houses in flood zones, mudslide zones, and avalanche zones – and the question is how you effectively spend one taxpayer's dollar to solve another home. We do have big problems all over the jurisdiction. The All Hazards Mitigation Plan lists problems for the jurisdiction and lists

potential solutions for those problems, and that's one of the ways we start to work with partners to identify funding and solutions for those problems. So that's one of those things we should be looking at potentially to build into the All Hazards Mitigation Plan, to keep on our radar to try and find avenues for funding too into the future, but it's very difficult as to decide how to spend our current funding – which has none for mitigation. It's a tremendous number of hazards for the number of homes we have in our jurisdiction.

55:02 Teri Camery

Just to elaborate on what Tom is saying – along with the regulatory review that Alix has mentioned several times, coming up next year, that grant from FEMA includes what we're calling mitigation recommendations where you would be. In the contract, we'd be asking the successful bidder to also look at potential engineering interventions and mitigation measures. We don't know if there are any, or where they might be appropriate, but that would be part of that study.

55:37 Alan Jones

So, can I just speak to that a little bit there as well, Alix? Because I think there's been a few questions I know there's been a couple questions further down that are going to come up about this one particular area. And, I think this G000 Park path in particular and this hazard boundary that we have about there – that area wasn't identified previously in the previous mapping. There has been some – there were some lines drawn, I believe, in the 2012 CBJ All Hazards study, and so that area I spent a lot of time with – like on the ground, mapping that. Not those areas, really only that G000 Park is the one that has potential for creating avalanche hazards – it's steep, it's gullied, it's not very well forested within the gully itself... [lost audio]

56:50 Vlad Roujanski

I cannot hear you.

56:53 Alix Pierce

Yeah, we lost your audio.

56:55 Vlad Roujanski

Alan, we lost you.

56:58 Alix Pierce

I wasn't sure if that was just me.

57:25 Alan Jones

Can you hear me now? Yeah, I'm not sure what's going on... But I was just going to say that that boundary that we've done – that moderate to low boundary – is actually a lower limit of that avalanche hazard area, and any of those residences in that area are actually in the low hazard zone. I think, like I say, there's a couple questions down later about that and concerns, so it's not like – it doesn't include climate change considerations, but this is the current state, so any of those properties downslope of that area, even though I've identified an avalanche hazard in this G000 Park, doesn't mean that's going to expand and start impacting properties downslope of that location. It means, as of the current times, it's a low hazard area below that moderate-low hazard line. Hopefully that makes sense.

58:15 Alix Pierce

Thanks. So, the next question is [reading] So if we change from moderate to high does that mean I will no longer be able to insure my house?

We – I can't really speak to how the insurance industry is going to react to these maps. I don't know if Tom has any insight into how they're reacting currently to the hazard designations.

58:43 Tom Mattice

I don't know about change and hazard but I do know that we have houses both in Moderate and Severe areas now and to change home ownership those require loans – most of those loans require insurance so I assume people have hazard for high insurance for high hazard areas now and I would assume it will still be available. Obviously, that could mean a change, but I don't know that.

59:05 Alix Pierce

Thanks, Tom. So, this one is specifically for you, Alan. [Reading] I understand that active avalanche mitigation is risky for people in infrastructure, what about protection structures?

59:18 Alan Jones

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Yeah, and I did answer, this might be the same fellow I answered or a person I answered earlier on, because I did talk to control things like remote avalanche control systems and helicopter bombing and things like that as not typically being best practices for protecting urban areas. It's done in Alta, it's done in Alpine Meadows, it's done in a few jurisdictions in the U.S., and very limited jurisdictions in Europe, but it's typically not considered best practices. But structures *are* – again, it wasn't part of our scope to look at mitigation structures – but certainly things like snow nets, stopping dams, and diversion structures – those *are* considered best practices for protecting urban areas, and in some cases could be effective and, in many cases, would not. I think the Behrends – the SLF study from 2011 looked at some of these options and, really, I think it would be a big challenge in some of these areas, given the size of these paths, in terms of protecting and cost – we're talking tens, if not hundreds, of millions of dollars to protect them.

60:32 (= 1:00:32 in Q&A recording) Alix Pierce

So, the next question – thanks, Alan, is [reading] It seems unexpected that the Behrends neighborhood would be underlain by a morainal deposit. If there's an active avalanche or landslide path, you would expect the marine to be covered by debris flows.

60:50 (= 1:00:50) Alan Jones

It's both and I think this is probably a good question for Vlad or Rita.

60:59 (= 1:00:59) Rita Kors-Olthof

Do you want me to tackle this Vlad, or do you want to go for that one?

61:03 (= 1:01:03) Vlad Roujanski

Go ahead.

61:05 (= 1:01:05) Rita Kors-Olthof

Okay. Well, the Behrends neighborhood – I assume that means the area that was mapped glaciomarine between Behrends and Glacier, and over to the cemetery. Essentially, what's mapped from the air photos is what you can see the formation of, or the form of, which allows you to make a judgment as to what type of material that is. So clearly, when the area was mapped, they're mapping what's the most clear type of geomorphology or shape of the soils and of the deposits that tells them what that is. There may be other materials over top, like if there's organics, or if there's another deposit that's a thin deposit, it doesn't always hide what's beneath it. So, generally, it's what you see the most of that defines what that structure is.

62:08 (= 1:02:08) Vlad Roujanski

And I just would like to add that we'll revisit that area and see whether we should do some additional mapping there.

62:22 (= 1:02:22) Rita Kors-Olthof
In the glaciomarine?

62:24 (= 1:02:24) Vlad Roujanski
Yeah.

62:25 (= 1:02:25) Rita Kors-Olthof
Okay.

62:29 (= 1:02:29) Alix Pierce

So, the next question [reading] How do you justify the moderate landslide risk designation in the Glacier Avenue and cemetery area? It appears you traced the lines from your surficial geology map, which shows that area as glaciomarine, absent of colluvial (landslide) deposits or veneer. I assume this is attempting to account for landslide runout, but it states in the report that runout modelling was not conducted, and that runout identification was based on "mapping the extents of historical landslides". I do not see any historic information in the report that supports this area being mapped as runout, and using Glacier Avenue and/or the boundary between glaciomarine/anthropogenic deposits is contrary to the statements in the presentation that hazard areas don't respect human boundaries.

63:16 (= 1:03:16) Rita Kors-Olthof

Okay, I can probably answer this one. The changing of the boundaries there and to lower the boundaries down to Glacier Avenue, that was because of news reports that indicated that debris from above Behrends was migrating along roads, like along Highland Drive and down to Glacier Avenue, and so that indicated that that line should come down further than what had been mapped. The problem with *only* mapping is that, as we

mentioned before, slides and slide debris, they tend to get cleaned up on the road, so they don't necessarily show up on the air photos. So that's how you get those boundaries, where you see, oh, okay, this looks like a debris flow, or this looks like a slide, but you're not seeing the whole thing. So, unless you capture those interim bits of information like news reports that says where the debris went, then you don't get the full picture. So that's what happened here and that's how that boundary was marked.

64:14 (= 1:04:14) Alix Pierce

Thanks. So the next question is [reading] Tonight or at some point we'd like to better understand how the Starr Hill landslide designations were determined. Even the 1987 maps have seemed odd regarding boundaries.

And we talked a little bit about Starr Hill, but does anybody want to go into a little bit more depth about how Starr Hill was rated as it is.

64:53 (= 1:04:53) Rita Kors-Olthof

I've just been reviewing some photos from the Starr Hill area, in particular, the area on 6th Street and above Nelson Street and, to me, it looks like there's a lot happening there on that slope and for that to be marked as a High or Severe hazard, that definitely makes a lot of sense to me. It may be just luck that the houses are close enough to the front that they don't really see a lot happening all the time. But I have also recently heard about some issues with some of the properties where, well, in one case a tree came through the house, and in another some rock came out down the back and even down to the other side of Basin Road. So, clearly there's things going on there that should be recognized, and maybe they just haven't been recognized before this or recognized in a different way based on the 1987 mapping.

65:52 (= 1:05:52) Alix Pierce

Thanks, Rita. So, next question [reading] Both avalanche and landslide mapping included limitations that other current and future changes (for example, climate change) could modify the analyses and recommendations in the reports. How do property owners prepare for these changes? How can property owners be sure that any mitigation recommended through site-specific geotechnical surveys and implemented now are effective in the future? Based on this assessment, compared to previous assessments, property owners can assume that hazard assessment will change throughout ownership, how are we supposed to prepare for that, especially financially?

That is a multi-faceted and complex question. Does somebody want to take a stab at starting and I can try to finish.

66:52 (= 1:06:52) Rita Kors-Olthof

Yeah, I can have a start at it, if you like. Essentially, if you're going to do a site-specific evaluation, you are going to want to be sure that your scientist or your engineer is going to look at the possibilities that climate change is going to require something else into the future. Pretty commonly up north, we're talking about 20 or 30 years into the future, and it'll change a little bit depending on what people want their service life to be and that kind of thing, but with climate change right now, it's a moving target, and nobody really knows quite where we're going to end up. But the best you can hope for is that your engineer or your geoscientist is going to have their best estimate of what's going to happen with climate change, what's going to happen with the weather, what's going to happen with storms, and come up with a good design to help protect your property, and if it needs to be reassessed in 20 or 30 years they'll probably say so.

68:00 (= 1:08:00) Alix Pierce

And I think I'd add that in this project kind of represents the City trying to do that on a macro scale. This project, the other grants we've applied for with FEMA, our priorities we've submitted to FEMA, the updating of flood regulations, the all hazards mitigation plan, and the continual updating of that, are our efforts as a land manager to make sure that the public has accurate information. And I personally believe that it's our duty to periodically continue updating our documents to reflect modern science, to reflect changes, and to reflect advancements, and mitigation options. And, you know, kind of one of the scary things about owning land is that you never ultimately know what could happen to it, but Rita gave a good description of the steps you can take on the site-specific basis, and we're trying to do the same thing on a community-wide basis.

69:26 (= 1:09:26) Alan Jones

Maybe I'll follow up on that from an avalanche perspective too, because we do have tools in our toolboxes as engineers to assess this. I work on a lot of projects where our clients do ask us to do future projections of climate change effects so we can do things like look at climate data in terms of precipitation and what

snow is going to do. We can look at future forest, look at the – it can go both ways, like I mentioned before, like you could lose forest, in which case the risk could increase, but I also have many properties I work on where the risk has actually decreased over time with reforestation. So, you can actually do assessments of future changes in forest cover due to climate change or pests or whatever, and a lot of – essentially what we do is expressed in terms of probabilities, probabilities in the future, so you can assign probabilities to different effects and then take that in globally and effect and assess it in terms of what's that mean in terms of a 300-year return period. So, there are tools, so if you're doing site-specific assessments, that's something that you can and probably should ask your professional to address in their work.

70:46 (= 1:10:46) Alix Pierce

Thanks, Alan, and I will say from a regulatory standpoint at CBJ we don't ask people to project climate change, but we ask new development on steep slopes to complete a hillside endorsement where an engineer needs to sign off on the engineering for the slope. We have regulations about building in the floodplain. And we try through our regulatory framework to do what we can to protect the community and protect people's properties.

71:30 (= 1:11:30) Alix Pierce

The next question is [reading] The severe landslide designations seem to show gullies opening up into wide swathes downslope. How confident are you that once the gully opens up, all the property downslope of the gully is at equal risk of a "severe" landslide.

This is a Rita question.

71:46 (= 1:11:46) Rita Kors-Olthof

Yeah, I can answer that one. The problem with those gullies opening up is that they're a fan or a cone and you can't really predict where that's going to dump all that debris – that's how those fans form in the first place. If it always went in the same direction, you would have a very narrow channel, but because it can go in any direction that's how you get those big cones forming. And so you can't really predict or say unless you do earthworks, like at the bottom of Snowslide Creek, where there's been significant work done to make sure that those avalanches get directed and they would direct the debris flows as well. Unless that work would be done on every single one of those paths then you can't predict whether it's going to go down the middle or go down either side and that's why it's all marked the same.

72:40 (= 1:12:40) Alix Pierce

Thanks, Rita. The next question [reading] To Alan Jones so your calculations indicate that the impact of an avalanche on the Behrends Avenue path has the potential of 600. What do you calculate for Thane Road, if you have done these calculations?

73:01 (= 1:13:01) Alan Jones

Good question, thanks for that. Yes, we have done those calculations. Just to put it in perspective, if we're talking a large avalanche path, and we're calculating something that would generate a 600 psf impact pressure, we're talking something that's going about 22 miles per hour or 10 metres per second, which is actually a pretty slow-moving avalanche. Our work is done in metres per second, so I'm looking at – thinking about – the Behrends avalanche path, for example. We have avalanches moving at about 40 metres per second in that path, which is about four times the minimum speed that would generate a 600 psf impact pressure. Similar on Thane Road, looking at the Snowslide path, that's going to quite easily generate a 600 psf impact pressure. So both of those can, and will in the future, and have in the past, generate impact pressures in excess of what's needed to be designated as a Severe hazard category. And that would destroy – damage/destroy wood-frame structures quite readily so... I actually don't see the question anymore, but I think hopefully that answers it. We did do these calculations, and that is essentially what's used to determine where this boundary is between the Moderate and Severe hazard areas. So, yes, we've done that for all of paths. And you can see even in the appendix, we did present results from the RAMMS avalanche modeling that we did in one of our appendices, and you can just see some of those impact – or not impact pressures – velocities right on those images – they're scaled in metres per second.

74:55 (= 1:14:55) Alix Pierce

Thank you. The next question [reading] have you projected how much of the 20th [Century] landslide activity was due to mining activity?

75:06 (= 1:15:06) Rita Kors-Olthof

I can answer that one. We haven't really directly tried to calculate what percentage. There seemed to be only one story that suggested that one of the slides might possibly have had a contribution from mining activity, and that was due to the possible link to the leaky flume from the Alaska-Juneau mill and flume area. That

happened during the 1920 landslide on Mt. Roberts, and there was some suspicion that, because it had been leaking, that maybe it was contributing to that landslide. But, then again, there was also two inches of rain, so that's really tough to say. But no, there hasn't been an actual comparative study to say, "Oh, this was because of the mines," or "Oh, this was clearly not the mine."

75:57 (= 1:15:57) Alix Pierce

Thank you. Next question [reading] Can you tell me when this path G000 Park ran last? And/or what was the record that you are sourcing?

76:09 (= 1:16:09) Alan Jones

Okay, I can speak to that path. It actually has both avalanche hazards and debris flow hazards. I walked personally - I walked that path extensively and observed there's actually structures in there. There's evidence that debris flows right in that gully, and there's actually some old structures there that were constructed to prevent or mitigate debris flows in some manner - some sort of homemade structures there. I'm not sure who did those, but they're there. So, in terms of history, we don't have historical evidence from the records or reports or previous studies, so the hazard assessment on that would have been field observations, modeling, and expert judgment to determine that that path has potential to create an avalanche hazard. And, it's actually, even though it's in the forest, it's actually not a very well densely forested area. So, that's really our interpretation of how that came about. I don't know if Rita wants to talk to them from a debris flow / landslide perspective but certainly there's a fair bit of source material up in there that I observed.

77:25 (= 1:17:07) Rita Kors-Olthof

Yeah, that whole slope looks like there's a lot going on, so I wouldn't be surprised to see that that would be marked as a severe area because there *is* so much going on, on that slope.

77:40 (= 1:17:40) Alan Jones

And then back to the avalanche hazard - I think I spoke about this earlier - that path, actually, the way it's been mapped doesn't affect any of the residential properties for avalanche hazards. Any hazard that's been mapped down there is related to landslides.

77:58 (= 1:17:58) Alix Pierce

Right. Thank you. Next is a comment saying [reading] Terrific presentation! I appreciate the integration of the historical information and photos with all of the fascinating science. Thank you, CBJ and contractors.

78:12 (= 1:18:12) Alix Pierce

Next question [reading] The landslide areas do not take infrastructure developments into account, but some of that infrastructure would obviously stand in the way of a slide. How can that be taken into account?

78:25 (= 1:18:25) Rita Kors-Olthof

Essentially, the mapping has tried to try to map where the landslide could go, would go, with or without infrastructure. So, if indeed there is infrastructure in the way, then that's going to be, or have to be managed in some engineering way to help protect those structures if it's in a zone that would potentially cause damage.

78:49 (= 1:18:49) Alan Jones

I'd say there's one exception to that and that's in the Snowslide path. There's actually a constructed diversion structure in that path that does affect the avalanche mapping that we completed. And I would assume some of the mapping that Tetra Tech did on the landslides side. That ran this winter, diverted dense flow to the north, and that was considered in our map in both the landslide and the avalanche work. That would be the only exception, I believe.

79:22 (= 1:19:22) Rita Kors-Olthof

Right, because we would expect that that earthworks would have some effect on those debris flows also.

79:29 (= 1:19:29) Vlad Roujanski

That's right, yeah, and it was mapped accordingly. So, it clearly shows how we anticipate that debris flow and/or the debris slide will go.

79:46 (= 1:19:46) Alix Pierce

Thanks. So, the next question is [reading] I'm interested in more info on the Hermit/Rheinhardt area that is now in severe, though not seeing recent activity or other markers in the report - the slide in the grating drain at Irwin bridge is in the Bathy creek avalanche path rather than in the Hermit/Irwin/cemetery area. Thanks. And great job and info, thanks!

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This one, if you can speak to it, great. If not, we might need to follow up directly by email.

80:20 (= 1:20:20) Alan Jones

I can actually speak to it. Again, this was extensively reviewed by both myself and Shane in the field. It's a very complicated location, so both of us spent a lot of time wandering around and looking at that area in detail. This one's really complicated from an avalanche perspective because my personal observations in the field, and the vegetation evidence, and the modeling – a lot of that indicates that it actually stops higher than is mapped. But, we do have historical information that talks about that particular path reaching down to the road, and I talked to local experts. That's one I definitely discussed – with, possibly with Tom, but certainly with Bill Glude – in the area, and there's a fair bit of historical evidence that that avalanche ran down to the road, even though it sort of is a bit counter to some of my field observations. So, that's a case where I couldn't exclude historical information as informing where the hazard boundary goes, and I suspect it might be similar too, on the geohazard side. But maybe, Rita, you are able to talk to that at all as well.

81:38 (= 1:21:38) Rita Kors-Olthof

No, I think you've covered it pretty well there, Alan.

81:41 (= 1:21:41) Alan Jones

Yeah, so lots of information, lots of very complicated modeling and information that we had to consider for that area.

81:54 (= 1:21:54) Alix Pierce

Thank you for that. [reading] What are the regulations you (Teri) referenced when speaking to partial designations?

82:11 (= 1:22:11) Teri Camery

Yeah, I think that kind of relates to a previous question we had. In part, I would prefer to double-check the wording on the regulations but, with what I know at this point, I would say that if any part of the hazard designation touches the property, then the development regulations would apply to the entire parcel. And, if there's more than one, we would apply whatever is most restrictive.

82:45 (= 1:22:45) Alix Pierce

The next question [reading] For houses in a high landslide risk zone, what does “restricted development and density” mean? For example, if someone took down an existing building in a high landslide area, could they rebuild on that property? Or if they wanted to add an apartment to a house in a high landslide zone, could they get approval for that?

So, the answer to that under our current regulation is yes to the first, no to the second. So, if you have an existing property, it can be rebuilt under our current regulations. If you want to add additional living units to a property in a Severe zone, that's not allowed.

83:34 (= 1:23:34) Alix Pierce

The next question is [reading] How will Trucano potential multi-unit building across Gastineau Avenue from old AJ concrete structure be treated for permitting?

I don't know. They're – I don't know the answer until I've seen the development plans, so, sorry, I can't answer that one right now.

84:03 (= 1:24:03) Alix Pierce

[Reading next question] I'm not aware of any slide activity in the past 30 years other than avalanche for that area, nor loss of vegetation or trees other than avalanche which are in the Bathe gulch.

I think this was the Irwin Street question from earlier, so I think we've given a pretty complete answer to that one.

84:30 (= 1:24:30) Alix Pierce

And then this is a follow-up to the G000 Park question, about records. And I think we answered that pretty completely. Alan, did you have anything to add?

84:47 (= 1:24:47) Alan Jones

Yeah, just, I guess, in regards to the comment about not being sufficient snow to build up to form an avalanche in this area, and I think the historical snow records in Juneau does really speak to there being the

potential to have that snow, even at those low elevations. We did the climate analysis at low, medium, and alpine – up in the high ridges – and certainly there's sufficient snow even within the forested areas – low elevation areas – to create avalanches in the right type of terrain. And this location happens to have the right kind of terrain – it's steep, it's gullied, and there's evidence of both avalanches and landslides in that feature.

85:32 (= 1:25:32) Alix Pierce

Thank you. So, the next question, which we've answered is [reading] How was the study area decided on? It seems like many other [areas of town] have slope hazards.

And we gave FEMA four priorities for where we wanted to – areas that we believe required landslide and avalanche studies. We got funding for this one, and we hope in the future to be able to fund additional studies for other areas.

86:09 (= 1:26:09) Alix Pierce

And [reading] How is it anticipated to affect property values/taxes in the newly mapped landslide areas above the cemetery and downtown?

And, again, I think we've answered this one as well, but I'll restate that we don't know – we need this – we don't know what the future effects will be. We know what property values look like in the existing mapped High hazard areas, but we don't know if this will change the real estate market or the insurance industry, and taxes are based on property values. So, we don't [know]. This is the beginning of a process and we'll know more as these maps are adopted and we've lived with them for a little while.

87:32 (= 1:27:32) Alix Pierce

So, [reading] Could you please expand on what you said about thin versus thick colluvium in terms of landslide risk? Thank you.

Rita?

87:39 (= 1:27:39) Rita Kors-Olthof

I can tackle that one. The big thing about the difference in soil thickness, the thin and the thick colluvium, is how much water it can take up and actually retain before it wants to slide on whatever it's sitting on. So, for instance, if you've got a couple of feet of soil or rocky material with not much clay, and it's sitting on bedrock, and it's suddenly saturated, there's not much holding it on there, and there's not much of anywhere for the water to go or to be held in that soil, so that tends to make it a lot less stable and a lot easier for it to slide. Where, if you compare to a thicker soil layer, then there's more chance that some of that water will be taken up or taken up into roots – you'll have thicker tree rooting and all those kinds of things, so that's kind of the short version of how that works.

88:38 (= 1:28:38) Alix Pierce

Thank you. Next question [reading] It sounds like the plan is to adopt these maps soon, but decide upon and adopt a policy a year or more later. That seems like a mismatch. For example, the old maps followed property boundaries, but the new ones don't. Shouldn't we wait to implement maps until the policies for them are ready? Otherwise, homeowners will be caught between new maps covering their property, but old policies that weren't written for the new mapping situations. That seems likely to complicate home sales or developments for the next few years.

I think I'd respectfully disagree with that. We need this baseline information in order for – to do the policy work, and on top of that, our existing regulations are pretty straightforward when it comes to development restrictions or guidelines in Severe or Moderate landslide and avalanche hazard zones, and I don't think that more accurate maps particularly change that. I think I do agree that our regulations need to be updated and that's another extensive process, but I think that the maps are separate from the regulations. The maps are really important public safety information and we should be using accurate maps to guide our decision-making. And the whole regulatory framework is more of a code update that we've needed to do for a long time, and we'll have accurate mapping information to work off of for the consultant that we hire to lead the regulatory conversation. Anybody else have anything to add to that, Teri or Tom?

90:43 (= 1:30:43) Tom Mattice

Well, I think they're very definitely separate conversations. I think it's important to get the hazard right and get the maps right. I don't think what can be built there will change whether or not a map is accurate. I think if you have questions about the science, then ask them, but I think that that's really the focus while we're here, and I think they did a great job on their science.

91:04 (= 1:31:04) Teri Camery

And just to add to that a little bit more, I certainly don't see us changing the restriction on density in the highest hazard areas in the future. We'll see what the process looks like, but I think that's a pretty minimum regulatory standard.

91:23 (= 1:31:23) Alix Pierce

Thanks. So, the next question [reading] My property is located at the very northwest end of the survey map. It's colored "red." However, I don't see any historical activity. Granted, it is very steep, but that seems little, considering there is nothing above it to create a snowslide event and there is nothing there to slide if it is considered to be a landslide area. Can you explain why it is considered severe?

And I know we can't speak specifically to specific properties, but does anybody have general comments about the northwest end of the map?

91:58 (= 1:31:58) Alan Jones

Yeah, I can speak to that for sure. This is one of the more challenging areas here. Like I was saying earlier, definitely residential areas I had much stronger focus or larger focus on those areas where I would be affecting properties and drawing lines around properties and this is one area where these paths actually weren't identified. Like I said in my presentation, everything from the White path north was not mapped in any level of detail prior to our work, except when you go back to 1972, and you actually look at some of Frutiger's work, and a lot of these areas actually were mapped in Frutiger's work. So, our work was independent of that, of course, but we had to consider that. And what I found in this area was, there was a lot of evidence that reached right down to channel Vista Drive of destructive avalanches. They're old, but they are destructive and, at this point, they actually run through the forest, this mature forest. This is – a lot of these paths up in the northwest corner are things that actually do have future potential, so this is where we have to consider what's come before. So, I'm looking at trees that are maybe 100-plus years old that have evidence of significant destructive potential, and I have to project that into what's going to happen in the next 300 years. So, I have to use the information from the past, to project it to the future, but there was very clear evidence not very far above quite a few of the properties on there. So, again it was very difficult because I knew there were new paths that weren't clearly mapped on the 2012 – what was presented before and in the old hazard boundaries but, certainly, it's a great question. And hopefully that explains, even though there's not currently very large start zones in these areas, there's sufficient snow, there's sufficiently steep terrain, and avalanches do travel within the forest there, and can be sort of destructive, so that hopefully explains why we ended up having to map that the way it was.

94:10 (= 1:34:10) Alix Pierce

Great, thanks. So [reading] I'm confused. Did Alix just state that these new designations now limit all work on private property and also state that CBJ is unaware of property value impacts?

So, first part of that – no, I did not say that we were going to limit all work on private property. I'm sorry if I wasn't clear there. What I did say was that, in areas that are in Severe or High areas, we don't permit things like accessory apartments or additional density, but I didn't – but we still allow work on private property, land is still allowed to be developed in those areas. We do restrict additional density in those areas. And that's correct, we are unaware at this time of property value impacts.

95:15 (= 1:35:15) Alix Pierce

Next question [reading] What will the public process be to decide if the landslide map maintains the traditional 3-zone map vs the proposed 4-zone map? Is there a regulatory benefit to deviate from the 3 zones?

I don't think there's a regulatory benefit, but I do believe that there's a scientific benefit and that's why we've gone with the four zones, and Vlad or Rita can speak to that more, but our regulations will follow the advice of the scientists that created the categories. Vlad or Rita, do you want to expand on why we have four landslide zones?

95:58 (= 1:35:58) Vlad Roujanski

Yeah. Well, the addition of the fourth zone, it basically makes it – makes the hazard designation mapping more detailed, and basically that more-detailed designation can be used for various purposes, scientifically and practically.

96:34 (= 1:36:34) Rita Kors-Olthof

Yeah, it just gives you some idea of what kind of effort or what level of effort you might require to protect the structure in that area, for instance.

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96:55 (= 1:36:55) Alix Pierce

Thanks. Next question [reading] Our question for Starr Hill neighborhood designations has not been answered. Will the experts on this call be available to explain this after tonight?

Barb, I would suggest sending Teri an email with your detailed questions and we'll forward it on to the project team and try to get the answers that you're looking for.

97:22 (= 1:37:22) Vlad Roujanski

Yeah, that would be the best option. That would be the best way to handle that, because we need to look at that area again in more detail, and then we hopefully will be able to answer that question.

97:37 (= 1:37:37) Alix Pierce

Great, thank you. So [reading] With the new data, is CBJ going to provide accurate information about their property to homeowners that is above residences that is now labeled severe? This has not been the case in the past.

I'm not sure that I understand this question. Does anybody else? I think that they're asking if we're going to provide information, reach out to properties who, or property owners, whose properties have been labeled Severe. Teri, do you want to try to take a stab at this one? [RKO: or is it about CBJ property that's now Severe, located upslope of residences?]

98:22 (= 1:38:22) Tom Mattice

This could almost be –

98:25 (= 1:38:25) Alix Pierce

Actually, Tom, go ahead, and then Teri.

98:27 (= 1:38:27) Tom Mattice

Well, I'm wondering if they're questioning why we don't, for example, stamp deeds or titles as hazard area, and we expect realtors and people to disclose it to one another. Just wondering if that's kind of what they're getting at with the question.

98:45 (= 1:38:45) Alix Pierce

Teri, go ahead.

98:48 (= 1:38:48) Teri Camery

I guess I would say at this point we are leaving it up to individual property owners to look up their property status. We do have approximately 400 properties within the project area, so we don't have staff capacity at this time to look up the properties one by one. We're certainly able to help people on a case-by-case basis if they're not clear on what that designation is. We will continue to provide information, more details on the CDD website, but I don't believe we can be more specific than that at this stage. We'll certainly do more as much as we can, as time and plans become available.

99:40 (= 1:39:40) Alix Pierce

Thanks, Teri.

99:41 (= 1:39:41) Alix Pierce

Next question [reading] Will tsunami danger be included? This was important in considering Merchants Wharf redevelopment, I recall. If so, when, how? Thanks.

Well, Teri is actually also our flood – we call Teri “the Disaster Queen” – she's also our floodplain expert and – the flood maps for Juneau were just redone by FEMA within the last couple years, so maybe you can speak to that, Teri.

100:11 (= 1:40:11) Teri Camery

There's detailed flood map information available on the web as well. We recently started – I'm a little rusty on where it's at on the community development homepage – we just moved it to a site, a new site, but it's clearly marked as floodplain information. So, you can look up all the downtown properties from there. Flood risk downtown really is quite minimal. It's just right along the coastline, and my recollection of the trainings that I've gone to – maybe Tom has another opinion – is that the tsunami risk for downtown generally is really quite low. It's only likely to impact the area if you get a major earthquake at a high tide and then it's strictly the waterfront

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properties and it should have adequate notice to... [about 4 seconds missing at 101:03] later. Our risk here is really quite minimal compared to a lot of other areas. Tom, if you just agree with that, or have other information, please jump in.

101:10 (= 1:41:10) Tom Mattice

We have very low tsunami risk in downtown from current hazard. Current hazard really lies only in the form of an underwater slump in a localized environment. I think part of what they might be asking is - has Alan ever thought about what his avalanche does when it hits the water?

101:32 (= 1:41:32) Alan Jones

Yeah, I guess you could take that from that question, possibly. But, certainly, avalanches can create tsunamis – small ones. Usually, they're not particularly destructive, but some people here might be familiar with the town of Stewart - that's British Columbia, right by Hyder, Alaska. Actually they had an avalanche that hit the harbor, went across and damaged a bunch of boats, actually, on the other side of the harbor. Certainly, it can create tsunami hazards...

102:12 (= 1:42:12) Alix Pierce

Great, thank you, I just learned something.

102:17 (= 1:42:17) Alan Jones

Yeah, don't leave your boat in the harbor in Stewart, or Hyder.

102:23 (= 1:42:23) Alix Pierce

[Reading next question] Over what period of time were the two studies conducted?

We got the grant in 2019, right, we started this?

102:33 (= 1:42:33) Teri Camery

We got the grant in 2018, I think. The whole research process with Tetra Tech began in 2019, came up to do field work in September 2019, continued to do research over the fall, winter, spring, the following summer, and got us the first draft in August 2020, if I have all those dates right.

102:58 (= 1:42:58) Rita Kors-Olthof

Be about two years from when we started, I believe.

103:02 (= 1:43:02) Vlad Roujanski

That's right.

103:06 (= 1:43:06) Alix Pierce

[Reading next question] Are there regulations for tree removal in any of the four avalanche classifications? Given that trees hold the soil. [RKO: Note that this question says "avalanche" but seems to be referring to landslide.]

Not currently, no.

103:21 (= 1:43:21) Alix Pierce

[Reading next question] We actually have a previously written engineering report regarding our hazard area stating we are NOT in a hazard zone (and removed us from previous hazard designation), but now are proposed for severe hazard designation. Should we submit our letter, or what relationship does this previous document have to your current process?

Teri, you want to answer that one?

103:42 (= 1:43:42) Teri Camery

I can speak to that. First off, the maps need to be formally adopted by the planning commission and assembly before they go into effect. If they go into effect, the appeal process will remain in regulation and we would need to submit that report again. I again take into account the new engineering research established in Tetra Tech's assessment and have your engineer provide a counter argument, very specific to the results in that newly adopted report, and then we would accept that for consideration, review at the departmental level, have CBJ engineering, other entities will look at it and reach a decision from there.

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104:36 (= 1:44:36) Alix Pierce

Thank you. Next, this question is a follow-up to the question about the mine creating landslide hazard.
[Reading] What about the shaking of Mt. Roberts from the mine?

104:51 (= 1:44:51) Rita Kors-Olthof

We didn't do any consideration about the mining at all, in that regard, it wasn't in the scope.

105:10 (= 1:45:10) Alix Pierce

So next is [reading] Thanks for the great discussion.

105:14 (= 1:45:14) Alix Pierce

So, this is the Hermit/Reinhardt again [reading] Actually my question for the Hermit/Rheinhardt area was for landslides, and thanks for the avalanche info on complexity. It's more over to the left side towards cemetery - to the left of Bathy gulch that doesn't seem to show historical landslide activity. It would be great to get some additional answers on that, thanks very much!

105:36 (= 1:45:36) Alix Pierce

I would suggest emailing Teri, and we can get some good answers to your specific questions. And then she also wants to say a huge thank you to all of the presenters and for the hard work and on the public interest and thanks for all staying up late to answer our questions.

You're welcome.

106:01 (= 1:46:01) Alix Pierce

We have another thank you.

106:10 (= 1:46:10) Alix Pierce

[Reading next question] I live below CBJ property that is Severe, but I can't get info about the City's property. The city owns that property and has clear hazards to the residents below.

I'd suggest also sending an email and we can look at this, your property, specifically, and the City property that relates to it.

106:38 (= 1:46:38) Alix Pierce

Last comment [reading] I really appreciate this extended meeting and question/answer opportunity. This is a complicated and difficult process with lots of potential impact for our city and private property owners. Thank you for listening and for offering your time and attention as we consider what we are learning and as questions and concerns crystallize in the days, weeks, months to come.

Thanks for that and we have a few questions and answers that were provided... where we just typed answers to people directly. I'm going to let the project team log off, and then I'll read those for the recording so that people listening in can get their questions answered, but I'm not going to make the rest of you stick around while I do that. If any members of the public are interested in listening to those, if you didn't see it in the Q&A, you're welcome to stick around as well but, given that it's 9:15 p.m. and 10:15 in Vancouver...

Everybody's done a lot of good work tonight and I appreciate the public who have stuck with us through this, it's really useful information and it's been a really good discussion and I really appreciate you all coming out and sharing your comments and concerns as we move forward with this – what's a really difficult conversation about the hazards that exist in our community and the information that we now have about them and how we react as a city.

108:27 (= 1:48:27) Teri Camery

But before you all disappear, be sure to check back to the community development department special projects webpage. That's where you'll find all the project information, all the documents, you'll find my contact information – my phone number, my email for questions. Thanks again for your attention, thank you so much to Tetra Tech and Dynamic Avalanche Consulting – we really appreciate your time and efforts, and thanks to the rest of City staff.

108:50 (= 1:48:50) Alix Pierce

Yeah, thanks everybody for staying late and we will upload all three PowerPoint presentations so, Alan and Rita, if you could send yours to us, and an audio recording of the Q&A, so that all the information's available.

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109:17 (= 1:49:17) Rita Kors-Olthof
Okay, thanks very much, everyone.

109:19 (= 1:49:19) Vlad Roujanski
Thank you.

109:20 (= 1:49:20) Alan Jones
Thank you.

109:22 (= 1:49:22) Alix Pierce
All right so the first question that was answered was [reading] Please define the categories of severe, high, moderate and low for hazards.

These are defined in the provided report both for landslide and avalanche hazards. Please refer to the report.

109:38 (= 1:49:38) Alix Pierce
[Reading next question] Will Teri's presentation be emailed to all attendees?

We captured that just now.

109:53 (= 1:49:53) Alix Pierce
[Reading] Are there any places in the world that do proactive avalanche control above residential areas? i.e., monthly daisy bell clearances of cornices, etc., so the spring breakup won't be catastrophic to the residents?

There are some areas in the U.S where this is completed, but is not typically considered best practices for residential areas. The best example of the use of proactive avalanche control is Alta and Little Cottonwood Canyon, Utah. They also complete this in Alpine Meadows, California. In Europe, this method is used in some areas. It's important to keep in mind that avalanche control can damage or destroy the infrastructure that are being protected.

110:32 (= 1:50:32) Alix Pierce
[Reading] What is LiDAR data?

Light detection and ranging. LiDAR is an acronym. CBJ provided very high resolution LiDAR data which provides high resolution imagery, detailed topographic information, and bare-earth imagery which shows the underlying ground surface, for example, if there were no forest cover. It is excellent quality data and very useful for landslide and avalanche and hazard mapping.

That is a way better definition of LiDAR than I gave on the radio yesterday! Thank you, everyone.

111:05 (= 1:51:05) Alix Pierce
[Reading] It was just said that there were letters dated 1949 concerned with the school being in the avalanche zone. I do not believe any schools were there then. Follow up?

This was a letter written in 1949 to the superintendent of schools regarding the proposed grade school in Block F of the Highlands subdivision. They recommended that a safer and more suitable site could be selected to ensure the future safety of school children.

And for those that are still on or those that are listening, KTOO did – and I put it in the answer to this – a really great article on the history of avalanche policy in Juneau, and the reporter actually dug this up. They were proposing to put a school at the site where the breakwater currently sits now. It's worth reading that article. I found it really interesting.

112:02 (= 1:52:02) Alix Pierce
[Reading next question] I think the obvious question is how the Behrends area rated the same as the Thanen Snowslide path. Thane experiences an avalanche crossing the road with considerable frequency. Behrends Avenue has never had a debris flow across the street in historic times.

Then Alan answered, avalanche hazard as a function of both avalanche frequency and magnitude, i.e., impact pressure - please see the definitions of severe and moderate hazard. Areas where the impact pressure could

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exceed 600 pounds per cubic feet would be designated as severe even if the return period is longer than 30 years. That's why areas with different return periods can have similar hazard designations.

112:46 (= 1:52:46) Alix Pierce

And this is regarding G000 – we covered that one

And I think that might be all of the questions that we answered, besides me saying that we'll follow up with Starr Hill.

113:05 (= 1:53:05)

So, great. With that, I'm gonna stop the recording.

Thank you so much, everybody.

113:11 (= 1:53:11) End of Q&A recording.