US Department of Health and Human Services
Centers for Disease Control
National Institute for Occupational Safety and Health
Advisory Board on Radiation and Worker Health
Work Group on Lawrence Berkeley National Laboratory
Friday, April 5, 2019

The Work Group convened telephonically at 9:30 a.m., Paul L. Ziemer, Chair, presiding.

Members Present:

Paul L. Ziemer, Chair
Bradley P. Clawson, Member
David B. Richardson, Member

Also Present:

Ted Katz, Designated Federal Official
Nancy Adams, NIOSH Contractor
Bob Barton, SC&A
Elizabeth Brackett, ORAU Team
Ron Buchanan, SC&A
Joe Fitzgerald, SC&A
Lara Hughes, DCAS
Tom Labone, ORAU Team
Megan Lobaugh, DCAS
Jenny Naylor, HHS
Jim Neton, DCAS
Mutty Sharfi, ORAU Team
Stephen Spanos, ORAU Team
John Stiver, SC&A
Tim Taulbee, DCAS

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Proceedings

(9:29 a.m.)

Welcome and Roll Call

Mr. Katz: Welcome, everyone, to the Advisory Board on Radiation and Worker Health. It's the Lawrence Berkeley National Laboratory Work Group. It's been quite a while since we met. And we have quite a bit of work to go through, the Site Profile review -- the agenda for the Work Group is posted on the website. And I have only posted the most recent back and forth documents between the Division of Compensation Analysis and Support and SC&A related to this review.

We'll be talking about more findings and more resolutions than are related to these last two reports, but they both go back to 2014, 2013 and even before that.

So if anyone on the line needs any documents after this meeting and needs help finding them I'll be glad to help. But anyway.

We're speaking about a specific site so for agency related staff, contractors, and so on, please speak to conflict of interest when you do this.

My Board Members don't have conflicts of interest which is why they're on this Work Group.

And I have full attendance, so Dr. Paul Ziemer who's the chair, he's in attendance as well as Mr. Brad Clawson and Dr. David Richardson, they're in attendance, so we have the whole Work Group here.

So let's go on to roll call.

(Roll call.)

Mr. Katz: Okay, then let me just remind everyone, since we have more than a dozen people on the line, to mute your phone except when you're speaking. It will help the audio quality for everyone else, and please don't put the call on hold at any point. And, Paul, it's your meeting.

Chair Ziemer: Very good. Welcome, everybody. I'll officially call the meeting to order.

What I'd like to do as we proceed, and you have your agenda before you which identifies a number of documents that are pertinent for today.

The last time that this Work Group met was several years ago actually in the transcript -- was in February of 2012.

And if you look at item 1 on the agenda in the related documents, it lists the Site Profile called Rev. 1 as the first one that was reviewed. But just as I looked at my records historically there was what you might call a Rev.0 that was dated August 2006.

I don't know that any of us actually saw that. My understanding is that that was revised based on internal NIOSH reviews, and so the first document that I recall seeing was the 2007, April 2007 which is officially called Rev. 1.

And that was the one that was reviewed by SC&A which is under related documents, the second one, January 2010. No, I'm sorry, that was the SC&A review of Rev. 1, but Rev. 1 has an official date of 2007.

Now in January of 2010 we had the SC&A review of

Rev. 1, and the Work Group met in January of 2010, and we went over that SC&A review in quite some detail actually mainly to become acquainted with the issues of which there were 13, and Joe Fitzgerald led us through all of those issues.

The interesting thing was that in January 2010 -- I gather that SC&A also had access to Rev. 2. Rev. 2 officially is dated May of 2010, but at the January 2010 meeting there was a matrix prepared, that's item 5, it's actually Roman numeral V on the document report. And that matrix has in it some information about Rev. 2 even though Rev. 2 is dated later in the year.

As far as I can tell what apparently happened, and either Joe Fitzgerald or Jim Neton can correct me if I'm wrong, but it appears that just prior to the meeting SC&A had seen something in Rev. 2, they were able to identify that some changes had been made in terms of some of the issues. But SC&A had not had an opportunity to actually review the details on that, but they noticed that some of the needed information had been added in Rev. 2. So I'm a little confused about how that occurred.

But in any event when we met at the January meeting in 2010 those changes were identified that had not yet been reviewed. Well, they were just identified.

And then in the document -- Roman numeral VI is the transcript, and it would be probably -- if you haven't already reviewed that it would be worth doing.

We won't go through the SC&A review of Rev. 1 today except as it pertains to the actual, and we'll go through those issues as revised because there's

revision 6 then.

But in any event there has been a fairly detailed review of what the original issues were. Some -- as it turns out of the 13 issues, 8 of those as of our meeting were still pertinent which means that the -- even though NIOSH had made some changes those changes still needed evaluation.

There were four more that apparently were virtually identical between Rev. 1 and Rev. 2, and so those issues carry forward.

Another issue that really for the early years that was essentially negated by the SEC, and the SEC petition was really -- one that was identified by NIOSH. And the actual information on that petition is incorporated into Rev. 2.

That SEC petition was actually voted on by the full Board. It didn't even need to go through the Work Group because it was one identified by NIOSH as they prepared documents.

So where we really are on this list of documents, as I see it, is Roman numeral VII under discussion item -- or under -- item 1. And that starts with particular issues that we have NIOSH responses to and SC&A further reviews on.

So as I see it that's where we would actually start, but let me ask either -- well both NIOSH and SC&A if I have understood the sequencing correctly on this.

Dr. Neton: This is Jim. I'll have to defer to Megan Lobaugh who's POC now and maybe Lara Hughes who was the previous POC to verify what you said is true.

Dr. Lobaugh: This is Megan Lobaugh. I would agree with what you said. So what I tried to do with this listing of documents was list everything that I knew about. Because I'm new to the site, so I pulled this together to kind of come up with the history and see where we are today. And so I would agree with what you described.

The one thing where you spoke about number 5, that matrix was actually issued in January 2012. So I think --

Chair Ziemer: Yes, and actually that -- I think that -- let me see here. Number 5. Yes, that's January 2012. And let me look here. What was the date of our meeting?

Dr. Lobaugh: February of 2012.

Chair Ziemer: Yes, yes, right. I was saying 2010, but it was actually 2012. Yes, that's when we met.

So Rev. 2 was available in 2010. I'm sorry, yes. I had jotted down the date of the meeting incorrectly.

And probably -- so it's clear then that SC&A did have Rev. 2 and had done the comparisons at that point.

Dr. Lobaugh: Yes, I think it was preliminary. Oh, sorry.

Chair Ziemer: Yes, right.

Dr. Neton: -- had a preliminary version.

Chair Ziemer: Yes. And I did look through the matrix, and it was pretty clear that SC&A had not had a chance to review the 02 except to identify that changes had been made from 01.

And of course as part of that the SEC issue had been taken care of by the full Board and that in a sense negated the one issue. Well, it sort of partially negated it. I think it also makes clear that for partial dose reconstructions, for example people who didn't have the specified cancers or who hadn't worked 250 days there would have to be some partial dose reconstructions possibly in those early days. So some of those issues might still have to be addressed, but it wasn't clear whether that issue went away or might still have some parts dangling as it were.

Anyway, okay, thank you. SC&A, any comments on this?

SC&A Site Profile Initial Review and Response

Mr. Fitzgerald: No, I think from a chronological standpoint that makes sense. I mean, these are the reviews that the Work Group requested by done by either NIOSH or SC&A following the last Work Group meeting. So that would -- that would certainly be it.

Court Reporter: This is the court reporter. Can the speakers identify themselves? Thank you.

Mr. Fitzgerald: Oh, I'm sorry. This is Joe Fitzgerald.

Chair Ziemer: This is Ziemer again. So basically the matrix repeated all the original 13 items and just commented on which ones appeared to be unchanged in Rev. 2 and carry forward and which ones appeared to have been changed and needed to be reviewed. Anyway, in those cases except for the SEC negation of the one, I think in essence the rest of them carry forward.

So if it's agreeable we'll begin with issue 3, and issue 3, we have the NIOSH response to issue 3, and that

in essence is the response to that original issue. And then there's also -- and that is Roman numeral VII.

Then I think it would be appropriate to skip down to Roman numeral X which is the SC&A review of issue 3, and we can handle that, both of those, I think fairly quickly and then move on from there.

So just to handle this in an orderly way and this one is fairly straightforward, but I think NIOSH -- and, Dr. Hughes, are you going to handle this, or who will handle it for NIOSH? Just briefly go over your response, and then we'll hear from SC&A.

Dr. Lobaugh: Okay. This is Megan Lobaugh, and I'll be speaking --

Chair Ziemer: Oh, Megan, you're going to handle it. Okay, yes. Okay, go ahead.

Dr. Lobaugh: So issue 3 has to do with special forms of tritium and plutonium that weren't originally addressed in the Site Profile.

So in May of 2012 NIOSH put out a response to that issue. If you are following along, Work Group Members, in the BRS entries, this would be in the BRS entries for the LBNL Site Profile PDF if you have that. And issue 3 starts on page 11 of that document with the NIOSH response starting at the bottom of page 11, beginning of page 12.

So as I said in -- well, so the May 2012 response is where I'll start actually. So we put out a response saying that ICRP 66 actually handles the forms of plutonium that were being asked about.

So here we give information about ICRP 66 and the clearance half-times that are a part of the ICRP 30

respiratory tract model and how these combine to actually cover the uranium oxides that were asked about.

So our response was that the current ICRP models cover the uranium question that was asked as far as the assignment of insoluble forms of thorium and uranium are covered by the ICRP models. That was kind of a quick review, but any questions?

Chair Ziemer: Well, right. It seems fairly straightforward because SC&A basically said they agree with this, but let's see if SC&A has any additional comments on this.

Mr. Fitzgerald: No, I think at the time, Paul, we had some issues relative to retention times that we wanted to go back and look.

And Joyce Lipsztein went and just really compared ICRP 30 with 66, and as you noted I think we came around to agreeing that there didn't seem to be an issue on the retention times, that 66 would be in fact conservative and applicable.

So I think that issue went away. It was a question between the two.

Chair Ziemer: Okay.

Dr. Lobaugh: And, Paul, one thing I didn't address is the tritium. So initially the issue involved tritium as well, but Rev. 2 included the tritium questions that were asked about the special forms of tritium that were used onsite. So the tritium was already included with our last revision.

Chair Ziemer: Right. So let me ask Brad Clawson or David whether or not either of you have any

questions or additional comments.

Member Clawson: Paul, this is Brad. I don't.

Member Richardson: This is David. I don't either.

Chair Ziemer: Okay. Then I think the statement that says SC&A agrees with NIOSH response, I guess -- do I understand this to be a recommendation that the issue be closed? Joe, is that your recommendation?

Mr. Fitzgerald: Yes, we no longer have an issue with that one.

Chair Ziemer: Okay. So can I take it by consent to the two Board Members that they agree the issue should be closed?

Member Clawson: This is Brad. Yes.

Member Richardson: Yes.

Chair Ziemer: David, yes. And I'll say yes, and we will consider that one closed.

Let me ask Ted as we proceed here. And this will come up again at the end, but are we on the agenda for the meeting in Pittsburgh?

Mr. Katz: No, you are not.

Chair Ziemer: Okay. So we don't need to report anything yet till we get through some more things --

Mr. Katz: Right. Until we finish the entire Site Profile review --

(Simultaneous speaking.)

Chair Ziemer: Okay. Just wanted to have in mind whether we needed to report anything at this next

meeting.

Okay. Let's go next -- I think we can go sequentially on these. Next is issue 9 which has to do with medical X-rays. This is also, I think, fairly straightforward, but let's do the same -- Megan, do you want to quickly review the SC&A -- or the NIOSH response, and then we'll get comments from SC&A again.

Dr. Lobaugh: So issue 9 is in regards to X-ray exposures and the fact that there was not very much information on the X-ray exposures for the employees at LBNL.

So the main request is that the TBD should be expanded in its discussion of the medical dose. So if you're following along in the BRS entries PDF this would be starting on page 31 of that document.

Member Lockey: Hey, Ted?

Mr. Katz: Yes, I'm here.

Member Lockey: This is Jim Lockey. I'm sorry, for some reason my pass code didn't work. I don't know why, but I got it now.

Mr. Katz: Okay, but, Jim, this is Lawrence Berkeley National Lab. So you don't have to attend this. You're welcome to attend this.

Member Lockey: That's all right. I guess I got -- somehow I'm confused. I'm not sure what's going on here.

Member Clawson: That's nothing new. We're used to it.

Member Lockey: All right. Thank you, guys. Bye bye.

Mr. Katz: Okay. Megan, you can go ahead.

Dr. Lobaugh: Okay. So we -- NIOSH provided initial responses in February 2012 just before the Work Group meeting. And what we provided then was that these X-ray exams were typically done in private physicians' offices before 1964. So those would not be covered.

And then while X-rays appeared to be taken from 1964 to '75 at LBNL, there was limited information for this time period. So OTIB-6 would be used. So OTIB-6 is the default document that we use for assigning medical X-ray exposures for the program.

So the one other question would have been on the use of PFG, a specific type of diagnostic X-ray machine and whether that was used onsite. There was no evidence that a PFG was used onsite, and the fact that X-rays were done offsite prior to 1964, which PFG was really only used during the early time frame. So we found that it was not indicated that there was a PFG machine in use at LBNL, so those doses would not apply.

So a basic takeaway here is that we would apply the OTIB-6 default exposures when we don't have specific information. And with Revision 2 we updated a lot of the X-ray exposure information that we did have for the site.

Chair Ziemer: Okay, thank you. I noticed also at our meeting in 2012 that NIOSH or SC&A had recommended closure at that time. And I guess that's still true. But any comments, Joe?

Mr. Fitzgerald: No. We did get a chance to look at the preliminary draft and did see those changes, and that's where that recommendation came.

Of course, the TBD wasn't -- the revision hadn't been finalized. But that carries forward. We're still satisfied with the addition of the information.

Chair Ziemer: Okay. Questions, Brad or David?

Member Clawson: This is Brad. No.

Chair Ziemer: David, okay?

Member Richardson: Yes.

Chair Ziemer: All right. So I think we can go ahead, and there's agreement with the recommendation to close, so we'll consider this one closed.

Okay. I wish we could move this fast on everything. Now we have the IX -- document of issues 6, 7 and 8 -- a little longer, but let's go ahead and, Megan, if you'll walk us through this and make sure we all understand the response.

Dr. Lobaugh: Okay. So for finding 6 again if you're following along in the BRS entries document. this would be starting on page 21. And findings 6, 7 and 8 all relate to the external dosimetry program. Finding 6 specifically is about the insufficiency of the internal dosimetry.

So there were several areas where SC&A was asking for some more information. And I'll just talk about the main points of those areas. So the first one would be the NTA film energy threshold determination.

So from the review of the TBD there were a few different thresholds that we had listed. So at one point it was 500 keV, 800 keV, and then other sources list 1,000 keV.

So this is kind of a common discussion I think we've

had at other sites where what is the minimum detection of NTA film. That was one question.

The second part was on the failure to adjust recorded doses to correct for the lack of response of NTA and CR-39 in the intermediate and thermal neutron energy range. So again this is low energy neutron detection and how we're going to adjust measurement for that lack of response basically of the dosimeter.

The third part was the minimum detectable dose for CR-39 dosimeters. So again this was a question of what dose we were listing as the minimum detectable dose for these specific neutron dosimeters.

And the fourth was on the use of the neutron/photon ratios where neutron data are lacking. So there was a seeming inconsistency between the environmental and external dose sections of the TBD. So that was the initial -- those were the four main points of the initial finding.

NIOSH provided preliminary responses just before the last Work Group meeting. And what we provided was a revision -- our part of the Revision 2. So in section 6.3 of Revision 2 of the Site Profile indicated that a neutron to photon ratio can be applied to the LBNL film era which would be up through 1994. The LBNL Site Profile includes neutron to photon ratios based on site-specific information.

Also in Revision 2 we provided correction factors to account for angular dependence and fast neutron energy for the NTA film and CR-39 dosimeters. Our peer review research indicated that a limit of detection of 15 millirem was appropriate. So the table in -- the table 6-4 in Revision 2 was revised.

And then regarding the neutron to photon ratio for environmental doses and personnel dosimetry, there's a footnote that pointed out that these numbers were impacted by skyshine and shielding.

So NIOSH attests that the difference in the environmental geometry and shielding scenarios and occupational exposure geometry and shielding scenarios are why there is a difference between those two ratios.

So SC&A in 2012 -- sorry, did somebody have a question?

Chair Ziemer: No, I thought maybe you were done there, and I was going to move on to SC&A, but go ahead and finish what you were saying.

Dr. Lobaugh: So it may be appropriate to move on to SC&A at this point because in 2012 SC&A issued a review of issues 6, 7, and 8 together. So if they could give a summary of what that review was, and then I could provide the NIOSH preliminary response to that review. There's nothing posted yet.

Chair Ziemer: So we do have the SC&A response, but, Joe, why don't you walk us through that. I think we're on item 6.

Mr. Fitzgerald: Yes. Joe Fitzgerald. Ron Buchanan was the lead author on those three responses, and he's on the phone. Ron, can you take us through?

Dr. Buchanan: Yes. This is Ron Buchanan, SC&A. The response -- SC&A issued a response in September of 2012 to this response from NIOSH. And we reviewed the revisions in the TBDs and then the last entry in the BRS there you see our response in September 2012.

And what we found is, just to kind of summarize this, is that some of the issues that we initially brought up and NIOSH addressed in their revision we agreed with. However, like in some cases it did also raise some application questions or clarifications that needed addressed.

And so in that last entry on the BRS we discuss in some detail. We don't see that there's any great issues, but to actually -- using these in dose reconstructions was our concern. And we weren't sure of some of the uncertainties and what they included and didn't include. And so we asked for some clarification on actually using these in dose reconstruction, how they would be applied such as the correction factor for angular dependency and such, what was included and wasn't.

And so I guess at this point rather than just reading these I would say that we agreed with some of their revisions. It did bring up a couple areas of questions that we are still waiting for NIOSH to address, and we will then evaluate to see if it does clarify the issues.

Dr. Lobaugh: This is Megan Lobaugh again. So I can just provide our preliminary response path forward on finding 6.

We will revise the external dosimetry discussion to provide direct guidance on the use of the neutron to photon ratio when it is more favorable than the film dosimetry results.

Along those same lines we have since revision of this TBD come out with Report 87 which gives information about developing a quantile regression method to assign neutron dose. So we'll review the data that we have for Lawrence Berkeley to see if we can actually

use our newer method than the neutron to photon ratio for this, for neutron dose assignment.

Along the same lines we're going to determine if the correction factors are needed to account -- well, we know they're needed to account for the low energy response, but the higher energy neutron response -- will still be determined based on the specific site, and if they're needed then develop them.

(Simultaneous speaking.)

Chair Ziemer: You had a White Paper on that for SC&A to review then?

Dr. Lobaugh: What I would suggest is we will provide these preliminary responses and path forward in a written response, so a BRS entry or a write-up to the Work Group.

And then as we progress through this research, we would provide information back to the Work Group and SC&A.

Chair Ziemer: And so SC&A will need to await that before they respond -- on that?

Dr. Lobaugh: You broke up a little bit.

Chair Ziemer: Do you have a timetable on preparing that written response for SC&A to review?

Dr. Lobaugh: The preliminary response we'll be able to get fairly quickly because it will be a summary of what we talk about today. As far as the research goes, I anticipate that will take a little bit longer. So hopefully sometime this summer just depending on priorities and what people are working on.

Chair Ziemer: Gotcha.

Dr. Lobaugh: So the last thing I was going to say there was that we'll clarify and explicitly state about the uncertainties in that table 6-11 that were discussed by Ron.

Chair Ziemer: Very good. Okay. Let me see if Brad or David have questions or comments to add.

Member Clawson: Paul, this is Brad. Not at this time.

Chair Ziemer: Okay.

Member Richardson: So this issue is going to be held while they're investigating alternative approaches including quantile regression. Is that what I understood?

Chair Ziemer: That would be correct. We would not take any action on this other than to understand the path forward and add to that any particular additional comments.

Ted, we don't have to task this separately, do we?

Mr. Katz: No, absolutely not.

Chair Ziemer: Yes.

Mr. Katz: It's in progress is what the terminology is.

Dr. Lobaugh: This is Megan again. So when I entered these into the BRS system, I left the status as open. So one thing after we finish the Work Group meeting I can go in and update the statuses based on the votes that you have already done today or if we're in progress still on them.

Mr. Katz: Open -- is before we address it; in progress is really the next step which is where we are. So this one would get a status change. Okay, Paul. Paul?

Member Richardson: Paul, we're not hearing you.

Chair Ziemer: I had my mute button on. Sorry, I thought I took it off. So I wondered if there were any additional questions. This will remain open or in progress. I think we're ready to move on to issue 7 then.

Mr. Katz: Megan. Maybe Megan's on mute.

Dr. Lobaugh: I'm here. So finding 7 starts on page 25 of that BRS entries for the Site Profile PDF. And this finding has to do with the failure to justify the shallow dose to deep dose assumption.

So again I think just as a quick summary the initial finding was asking about the ratio that we are assuming within the TBD to assign shallow dose because for the time period from 1948 to 1981 no shallow dose was measured. And so the TBD did the ratio to calculate the shallow dose from the deep dose that's measured on the dosimeters.

So, in 2012 NIOSH gave the initial response which was that non-uniform exposures are addressed using program guidance which would be TIB-10 and TIB-13 if necessary. So that's a case by case adjustment that we do.

And that the Revision 2 of the Site Profile provides guidance on the assignment of shallow dose for the historical -- based on historical dose limits used by LBNL.

So, and then the other -- well, so I'll be more specific about the guidance. So, DCAS-TIB-10 is the external dose reconstruction for glove box workers and DCAS-TIB-13 is selected geometric exposures scenario considerations for external dose reconstruction at

uranium facilities. So those are the two program documents that we would suggest using on a case by case basis.

And then in 2012 SC&A provided an evaluation, or provided the same document that also covered finding 7. So if they could speak a little bit about what they found and then I can give our preliminary response to that.

DCAS Proposed Method to Assess Internal Doses

Dr. Buchanan: Okay. This is Ron Buchanan with SC&A again.

On finding 7 we did go back and our initial concern was how they derived some of their assumptions.

We did go back and see how they applied these various documents, TIB-10 and TIB-13 and OTIB-17. And with their explanation we did concur on some of these shallow dose assumptions, but did have several items that we still would like to have addressed and that is that the use of -- lack of shallow dose measurements during '48 to '81.

We find that the beta to gamma ratio for the uranium slab of 12 inch thickness, some places are quoted as 5 to 1 instead of 3 to 1 for the recommended ratio of 3 to 1 may underestimate the claimant's calculated dose in close distances. And that was one issue we had.

Another one was that if you do a shallow dose from the gamma measurements you lack gamma emission on P-32 and strontium-90 as listed in table 2-1 and 6-5 of that TBD. And there wouldn't be any gamma dose to derive shallow dose.

And so those were the two issues with the shallow dose.

And then we had an issue, I think it's more of a wording issue on extremity dose in that it said to use three times the whole body dose. However, sometimes extremity dose limit is five times the whole body dose as quoted there on page 61.

And so in certain cases using three times could underestimate the extremity dose.

And so those were two of the issues that we came up with and felt that some of the issues had been addressed, but did have these two issues or three issues left to be addressed.

Chair Ziemer: So we need to -- well, before I ask this, questions or comments from Dave or Brad.

Member Clawson: This is Brad. Not at this time.

Member Richardson: No.

Chair Ziemer: I think, Ron, you mentioned issue 10 which is the uncertainty issue. I think there was -- I can't remember if it was in this document or if we discussed it at the last meeting, but there was an indication that everyone felt that issue 10 and actually issue 11 would both be covered by resolutions to issues 2 and 4.

And at some point -- I'm trying to recall if it was in this document that we're looking at or if it occurred in our last meeting, but it was essentially recommended that we close 10 and 11 because they would be already covered once we resolved issues 2 and 4. I'm trying to remember. Megan? Do you recall that?

Dr. Lobaugh: So, for finding 10 from what I gathered there was discussion at the February 3, 2012 Work Group about the uncertainty. And the fact that it sounded like this issue was closed due to the SEC period because this was specific to internal dose. Finding 10 are specific to the uncertainty of internal dose prior to 1961 and the SEC for internal dose goes up through 1961.

So, from what I could gather the Work Group -- there was discussion on closing finding 10 at that time.

Chair Ziemer: It looked like we may have closed it or said that there was a way -- although in the SC&A review it mentions that for sections that might have to be done, the uncertainty issues would still be there.

But in any event if we get 2 and 4 resolved this becomes a moot issue because that would handle it.

The same is true of issue 11.

Dr. Lobaugh: So, issues 2 and 4 have to do with internal dose as well, but issue 7 that we're discussing now is external dose.

Chair Ziemer: Right. But since something was mentioned in Ron's discussion about issue 10 it just popped into my mind. But yes.

Dr. Lobaugh: And issue 11 from the last Work Group meeting it looked like there was discussion of making that addressed in the other findings. So how I entered that was as a draft in finding 2 and 4. So it marks it as closed as in not being counted towards our statistics, but that we are addressing it in our response to finding 2 and 4.

Chair Ziemer: Right. And that -- my question was to take specific action on that. We sort of agreed to it already, but maybe we can come back to that when we're getting off issue 7. Let's go ahead and finish up issue 7.

Dr. Lobaugh: So for issue 7 would you like me to talk about our path forward?

Chair Ziemer: Yes, exactly.

Dr. Lobaugh: Okay. So for issue 7 we're planning to review the NOCTS claim external dose data to see if it supports the shallow to deep dose ratios and any extremity dose ratios that we use in the current Site Profile.

We're also going to compile a list of the pure beta emitters in use at LBNL to determine whether we need to make adjustments to our ratios for that or have specific facilities where those may be applicable.

And we're going to research if there is area monitoring data available for these pure beta emitter sources and determine if an unmonitored approach is needed in response to those pure beta emitter questions.

Chair Ziemer: Is this going to require any more onsite data gathering or do you have everything you need to proceed on this?

Dr. Lobaugh: At this point we have not discussed doing additional data captures. I believe there's a lot of information captured over the last few years in response to the SEC and for other issues.

So I think we'll start with just research of SRDB and

we will definitely inform the Work Group if we do additional data captures.

Chair Ziemer: That sounds good. Ron, are you guys okay with that or did you have any other issues you think need to be added to that recommendation?

Dr. Buchanan: No.

Chair Ziemer: For the path forward. Will that satisfy you? Once you get that information you'll review it. But any other issues they should look at in that regard?

Dr. Buchanan: This is Ron Buchanan of SC&A.

No, I feel that that's a good path forward and we'll look forward to reviewing those results.

I did have one comment that Megan, if you could address the five times and the three times issue on page 61 also.

Dr. Lobaugh: Okay.

Dr. Buchanan: So that sounds good.

Chair Ziemer: And again I'll ask the Work Group Members any other comments or recommendations? Are you okay with this path forward?

Member Clawson: This is Brad. I'm good with it.

Chair Ziemer: Okay. David, you still there?

Mr. Katz: Paul, I think David was needing to step out to deal with some graduate studies matters. But he'll hopefully come back.

Chair Ziemer: Yes. Well, Brad and I are both in

agreement with it. I think it makes sense. So, we'll await the results of that work and have an opportunity to visit it again.

Let's see. So the other part of this one.

Member Clawson: Paul, we lost you again.

Mr. Katz: I think Megan's probably scrolling through.

Dr. Lobaugh: So, are we ready to move on to finding 8?

Mr. Katz: Yes.

Dr. Lobaugh: Okay. So finding 8 starts on page 28 of the BRS PDF document. And this has to do with the uncertainty in the beta gamma dosimeter response to radiation types and energies.

So in the initial Site Profile we discussed that LBNL had used electroscopes early on in the program there. And we discussed the use of the electroscopes and how they may be used in dose reconstruction.

And so there was a comment on the use of that early electroscope data for dose reconstruction purposes.

There was also another comment on the dosimeter response to very high energy photons and charged particles. Because LBNL was a pioneer in the high energy physics area there's thought that this would be an exposure potential at LBNL.

So, NIOSH provided an initial response in 2012 just before the Work Group. And we provided information about the revision that we made to the Site Profile and the discussion around the electroscope data.

And then there was the meeting in February of 2012

where SC&A was going to take a look at the response in that revision to the TBD and provide additional information on where we stood at that time. So if SC&A could talk about the response for number 8.

Dr. Buchanan: Okay. This is Ron Buchanan with SC&A again.

And again we reviewed the revisions. And it did cover some of the issues.

However, external dose is not covered in the SEC after 1947. And so there would still be dose reconstruction, applied dose qualified for the SEC. So we need information on the external dosimetry.

Now, the electroscope issue was evaluated and found that they did use film and TLDs after the '47 SEC ended for the external dose. And so we feel that that issue has been resolved and that part of the finding can be closed as no longer an issue.

Now, the thing that remains is the dosimetry calibration to the workplace energy, photon energies. And this is just very similar to the neutron issue that the photon -- generally we have our film, our TLDs calibrated using the radial isotope source and that's usually acceptable around facilities that are using isotope source.

However, as you know Berkeley had a lot of accelerators and higher energy possible photons. And later on most of these photons were degenerated and you could use calibration but in the early to mid years there was leakage and that sort of thing around some of the experimental accelerators that could create higher energy photons than the 1 to 2 MeV.

And so our main issue was was this compensated for.

If so, how. If not, how can the dosimetry data be adjusted just like we adjust the neutron dose for potentially missed or lower response to higher energy photons which at some point the dosimetry would fall off as the photon energy increased above a certain point.

And so our question was had NIOSH considered this. Was there some reference to back this up in some of the references in the attachments or the references in the TBD.

So we'd like to see a little more information on how this was addressed or if it was addressed and what difference it would make in assigning dose, and what the high energy photon fields were around the accelerators as a function in years and was this compensated for in any way either in their original dosimetry records or in the dose reconstruction records.

Chair Ziemer: Thank you, Ron. Let me ask you a question or possibly Megan can answer this.

Do you know if any of the cyclotrons at this facility were pulsed units? The reason I ask that is many detectors and even dosimeters behave very differently in a pulsed field than they do in a steady field. Particles of photons. Do you know that or not?

Dr. Buchanan: Yes --

Dr. Lobaugh: This is -- go ahead, Ron.

Dr. Buchanan: This is Ron Buchanan with SC&A.

Yes, they had pulsed field. And this was an issue there and several of the other national labs. And myself, I did work on the issue of pulsed field and

neutron detection because any electronic detector will be sensitive to the pulses.

Now, generally the solid state such as the film and the TLDs are generally not dose rate dependent at the exposure to personnel fields that we would see. And so yes, there was pulsed accelerators. And in this case we're looking at film or TLDs which would not be sensitive to the pulses, whether it was steady state or pulses. So that's where we stand on that unless Megan can put further light on that.

Chair Ziemer: Well, I'm even questioning whether that is actually always true. I think there's data that show that some solid state units still behave differently in terms of -- could almost look like a saturation situation if you look at maybe both pulse rates and energy. Are there any papers that support that that you're aware of?

Dr. Lobaugh: This is Megan. I'm not aware of anything, but we can provide a response on that if you're looking for more information.

Chair Ziemer: Well, I'm just wondering if there's any publications that would verify one way or the other for -- I mean, it's very common for electronic stuff. I've seen situations that I think CR-39 even sometimes shows this that the pulsing has a different response.

But maybe at the dose rates that we're talking about which are down at the personnel level, maybe it doesn't make a difference. I think that's what you're saying, Ron, right? We're not making measurements inside the cyclotron. We're making environmental type of measurements.

I was just wondering if there was anything to re-

confirm that we don't have to look at that issue. The energy issues are one thing. Pulse rate may -- if it's not an issue, if there's some publication that can verify that I would just add it in just so it clears up.

Mr. Katz: I think somebody has put us on hold maybe. Zaida, are you on the line?

Ms. Adams: Ted, I'll send Zaida an email.

Mr. Katz: Yes, thanks. They can cut that line.

Chair Ziemer: I got cut off for a minute. Are we hearing background music or something?

Mr. Katz: We were. There it is.

Chair Ziemer: I'm still hearing it.

Mr. Katz: Yes, it's still there. Zaida is going to cut that line but it will take a moment or two.

Chair Ziemer: Yes, okay. We'll just wait a second.

Mr. Katz: I think someone must have put us on hold.

Chair Ziemer: It's gone. Okay.

Mr. Katz: No, still there.

Chair Ziemer: Well, I don't want to go off on different radicals on this issue. I just thought if you could maybe -- maybe Ron, maybe you could both just take a look and see if there's any literature on that. There probably is. I think Ron is probably right that at the dose levels we're talking about or dose rate that we're talking about it's probably not going to be an issue.

Any other questions? So, this will be an issue 8 will

be like issue 7 I think. You have a path forward, right? What is the path forward?

Dr. Lobaugh: So, for issue 8 we're planning to update the external TBD with more specific direction not to use electroscope data past 1948. So that was one. We're in agreement about electroscope data. We want to specifically state that in the TBD not to get past 1948 because we have film and other dosimetry data.

And then for the second part we provided a lot of information in attachment A of the current Site Profile with regards to the dosimetry calibration and the workplace photon energies. So we will include a summary of that information within the Site Profile discussion itself to support response to that part of the finding.

Chair Ziemer: Okay. Ron, do you have any other issues you think need to be included?

Dr. Buchanan: No, I think that covers the issues. I guess we'll wait until the revised TBD comes out and we'll evaluate that further.

Chair Ziemer: Okay.

Dr. Lobaugh: This is Megan again. I do have a question. Would this go into abeyance in the Site Profile, or is there something you would like to see before revision of the Site Profile?

Chair Ziemer: Ron, from what you're hearing today are you satisfied that all we have to do is have it in writing?

Dr. Buchanan: Well, I would have to see the --

Chair Ziemer: You still would want to evaluate it, right?

Dr. Buchanan: Yes, right. I'd have to evaluate the revisions in the TBD that explain the photon response and where they got it and how they applied it before I could agree -- whether I agree with it or not.

Chair Ziemer: Right. So, that would then be in progress I guess, right?

Mr. Katz: Right. That's right.

Dr. Lobaugh: So you would like to see -- sorry, this is Megan. You would like to see our revision before the Site Profile revision is put out there. So you'd like to see our response before we actually revise the TBD.

Dr. Buchanan: Well, that would be helpful. And that way you wouldn't have to revise it again if I had problems with it. Yes, if you would send me the response and how you're going to change the TBD I could review it and that way you could -- we could agree or disagree on it before you issued it.

Chair Ziemer: Let me ask the process question then. On all of the findings do we need to get them all closed before you guys -- before NIOSH does Rev. 3? Or are you wanting to go ahead and work on it -- well, you're going to be working on it in a sense anyway. What is the preferred methodology in terms of getting to Rev. 3? Is it to get all these findings closed first?

Dr. Lobaugh: I think typically we know -- as long as we have a path forward and agreement we will revise the TBD and then have another review by SC&A.

But I think it also depends on the Work Group and what the Work Group prefers.

I would suggest us working on revision of the TBD concurrently and as we revise things providing them, but not necessarily holding up revision of the TBD because we have had a lot of data captures and information come in for this site that if we hold up revision of the TBD then that information isn't getting in there for other issues.

Chair Ziemer: Yes, yes.

Dr. Lobaugh: Moving forward with revision, providing information as we come up with things that SC&A should see or the Work Group should see.

Chair Ziemer: Yes. And so for example, if we get everything except one or two things resolved you would still want to have the revision out there for the dose reconstructors to use, the latest things even if every issue is not fully closed at that time.

Dr. Lobaugh: Yes. That's what I think.

Chair Ziemer: Gotcha. Okay. Well, that would make sense in a sense. Eventually there might have to be a Revision 4 also. Ron, you understand what she's saying then? Particularly as we get a number of these things resolved not to wait and wait and wait until the last -- very last thing is done if there's something holding up a particular issue.

Dr. Buchanan: I agree. At this point will we expect some response on the BRS paper or a revised TBD? What will we see first?

Dr. Lobaugh: I will -- sorry, go ahead.

Mr. Katz: Sorry. Just to be clear about this kind of thing it's fine to revise the TBD at whatever point it makes sense. We're making sure you're taking care of other people's claims as much as you can with current information, Megan. So that's all good.

But I mean, you might as well just -- when you're mentioning changes that you're inserting into a revised TBD just getting those out in either White Paper or memo form at the same time that you're working them out for the Work Group and SC&A makes sense and they can get on it as quickly as possible. And then with some luck they can actually get their review done before you actually issue the revision.

If they don't, that's fine. But that gives you a chance of working those in before the TBD actually comes out.

Dr. Taulbee: This is Tim Taulbee. If I could weigh in here. For issues 6 and 7 we're going to be providing written responses. We could do the same thing with this issue number 8 here as well so that you guys would have something to look at as we're doing those revisions for the TBD.

By the way, if there is an issue or something that you do have concerns about before that TBD comes out we can address it then.

Mr. Katz: Thanks, that's helpful.

Chair Ziemer: Okay. Again I'll ask both Brad and David if they have any other concerns on the path forward on this one. Or if you do have speak now or forever hold your peace I guess.

Member Clawson: If that's what it is then no, I don't

have anything at this time. This is Brad.

Mr. Katz: That's forever, Brad. That's forever. I think David had to go out.

Chair Ziemer: Okay.

Dr. Buchanan: This is Ron Buchanan. Could I ask one question of Megan? Megan, when you do do any of these things please let me know because -- well, if you do a paper or a TBD I'll know it. But if you put it on the BRS I don't check BRS for every site every day. So please keep SC&A informed of when you do provide a response so we can get evaluate it in a timely manner. Appreciate it, thank you.

Dr. Lobaugh: Yes, I will do that.

Chair Ziemer: Good, okay. I think we're ready for issue -- well, we already did issue 3 in connection with the NIOSH response originally. I think we're ready for issue 2. So Megan, you want to kick this one off again?

Dr. Lobaugh: Yes. So as you mentioned before, Paul, issues 2, 4, 11 and 12 are somewhat connected. So issues 2, 4, 11 and 12 all have to do with internal dose reconstruction. And there are some aspects that overlap in these findings.

Issue 11 that we spoke about a little bit before we believe was addressed in -- fully addressed in findings 2 and 4 given the discussion at the last Work Group meeting. So I think that's what we had kind of said a little bit earlier today.

But issue 2 is specific to insufficient information for internal dose reconstruction especially during the early years.

So this in the BRS document starts on page 3 of that BRS entry PDF. This initially was discussing a lot of the time period before 1961 which as we discussed before the SEC, the Class from before 1961 was actually added to the SEC for internal dose infeasibility.

So through the discussions since the last Work Group meeting or with the last Work Group meeting in mind there were some issues that were still open post 1961.

So there have been several -- it sounds like someone may not be muted. If they could mute their phone that would be helpful.

So, since the last Work Group there has been several documents going back and forth from SC&A and NIOSH. Let's just scroll through these.

So we provided our initial response on February of 2012 just before the last Work Group meeting. And these were dealing with table 5-4 which is the MDA information in the current Site Profile.

And we have reviewed this MDA information and come up with some additional specifics that we can add to that table for sure.

And this finding also has to do with use of gross counting methods for bioassay samples. So the most recent White Paper that we put out kind of falls up underneath this issue as well.

So, that's kind of the background on finding 2.

One thing I would like to ask is if SC&A could discuss the most recent memo that was put out in 2014, February 2014. So this is from what I could gather

the most recent information that we have or questions that we have from SC&A on this finding.

Mr. Fitzgerald: Yes, this is Joe Fitzgerald.

We did prepare two responses. One was right after the Work Group meeting which was September 2012. That's indicated.

That was in response to the Work Group's request that we look at this issue of exposure potential from internal emitters in the post '61 period and to get back to the Work Group in terms of any significance that we would identify, whether the bioassay was complete and adequate for that period.

This all stemmed from -- our original comments on the Site Profile of course dealt with pre-'61 which has since been covered by the SEC as you noted earlier, Paul.

So our concern was since the cutoff period for that SEC was founded on the standing up of -- essentially the standing up establishment of the LBNL routine bioassay program and some evidence that they were collecting and recording bioassays for LBNL workers.

Our comment was to whether or not that had been validated to any degree by actually evaluating the bioassay data, looking at the source terms. Of course, given this is a very major accelerator lab the list is very long as you can imagine, almost the periodic table.

And to really ascertain whether in fact the program was being implemented in a way where the MDAs were in fact adequate for measurement purposes, the periodicity of bioassay collection was sufficient and would in fact identify and measure the nuclides of

concern.

And sort of as a short form whether the program was effective to -- in terms of the analysis and monitoring of workers for the variety of machines and source terms that you could find at the facility.

And this was at the same time, when we were reviewing, I think it was 2009-2010. This was roughly the same time that we were examining similar issues at the other University of California laboratories like Los Alamos and Livermore.

And these issues figured very prominently at those laboratories in terms of the ability to bioassay, particularly in vivo bioassay for some of the shorter lived mixed activation products and some of the other nuclides.

So, the origin of this question came from one can ascribe a major step function in terms of the operations, the radiological monitoring operations at Berkeley to the establishment of the bioassay program at the end of '61.

But there was certainly a need from our standpoint for NIOSH to look at the implementation of that program to actually be able to validate that the program did in fact bioassay workers one would expect to have bioassay, the rad workers that were doing hands on maintenance, experimentation, health physicists, that kind of thing.

So that was what we had left the Work Group back in 2012. And we did prepare a report September 5, 2012 that walked through those issues in a preliminary way and looked at the question of adequacy and completeness.

Our conclusion was there was still in our mind some questions regarding the mixed activation products, some of the alpha emitters, shorter lived alpha emitters in terms of how Berkeley would have monitored for those.

We still had some questions about the effectiveness of the bioassay program from the standpoint of what reviews we could identify in that time period after '61 where there were several instances where they found up to 25 percent non-compliance in bioassays. So some question about completeness that we felt needed to be addressed as well.

So we outlined these issues in that report. And that again went back to the Work Group back in that time frame.

Jumping ahead to the February 2014 memo that Megan mentioned, that came after a NIOSH response to our paper. And I think that NIOSH response was December 2013. So it was about a year after that White Paper I referred to earlier.

And this was kind of a short memo, but what it essentially did. We went back because we still felt the NIOSH reviews were over-reliant on what Berkeley was reporting as their programmatic expectations, their policies and guidelines.

But there was little validation and actual identification of what the bioassay performance was at Berkeley in that time frame, and whether in fact the program itself was being implemented as prescribed by its procedures and policies.

I mean, this is kind of a basic question. I know we raise this almost at every site.

So our memo in February 2014 was saying we were still concerned about that. Up to that point the responses that we were reading were ascribing the effectiveness of the bioassay program pretty much to the procedures and SOPs that Berkeley had, but we didn't see any evaluation of the actual performance or implementation on the ground.

So, we went back and Ron Buchanan worked with me on this particular one and actually looked at LBNL claimants with job titles that we felt at that time would be ones that you would be looking for perhaps some internal dosimetry history and these would include things like occupations as accelerator operators, chemists, nuclear physicists, HPs, technicians, maintenance staff who would have worked in the sixties, seventies and eighties.

And we just wanted to establish what if any bioassays were being recorded. These would be gross alpha, beta and gamma for these individuals.

And the files that we searched were for PoCs less than -- that would in fact have a probability of causation less than 50 percent. And this resulted in 195 claims that will fall in that category.

And from that 195 we found 25 claimants that worked during the period of the sixties to the eighties. So that was the base.

And of that 25 only 4 claimants had any bioassay records at all. And none of these included any nuclide specific information. You know, if the gross gamma, beta and alpha were being used to screen and then would be followed up by more specific, nuclide specific analyses, spectrometry or something, that wasn't apparent.

So, based on that sampling we came back with a concern that NIOSH needed to do more than look at the written procedures, monitoring requirements and capabilities for nuclide identification and essentially look at the data and to establish whether or not the data was sufficient and whether it was adequate and complete.

That's similar to what we said earlier in 2012, but in this case we actually did some sampling to establish whether or not we could find that kind of information.

So the February 2014 memo was just sort of underscoring what we had said earlier, but in this case with perhaps more data to back it up. That's kind of where we left it back at that point.

So that's kind of where I would call the step off point between the issue 2 being sort of a question of bioassay data adequacy and completeness to kind of where we are now with what we've exchanged in the last couple of years regarding some new methods that NIOSH has come forward with in terms of air sampling.

And I'll turn it back to Megan, but that would be kind of where we were going back to the 2012-2014 time period.

Chair Ziemer: Let me insert here, ask this question. So, February 2014 basically describing where you ended, the questions that still remained at that point.

Megan, you've had at NIOSH those questions now since then, the past five years. Are you developing a response to that or have you already?

Dr. Lobaugh: So, one of the things that we've developed in response to not just this memo but the

finding in general for 2, 4, 11 and 12 is the White Paper method that we released in 2017. So that method to assess internal dose using gross alpha, beta and gamma bioassay and air sampling at LBNL.

So the White Paper was in response to this finding.

We will provide written responses to this memo specifically so that we can evaluate whether this White Paper either negates some of these questions because the White Paper is a more general approach as far as looking at all radionuclides that potentially an EE could be exposed to onsite. So it may negate some of these questions about what people specifically worked with and how we're assigning dose for those specific people because we're looking, taking a general bounding approach for almost everyone onsite.

So, we will provide written responses to that memo discussing specifics that maybe we've provided in the past that could answer some of these questions and how the White Paper methodology affects or does not affect these questions.

Chair Ziemer: So you're talking about the October 2017 document?

Dr. Lobaugh: Yes.

Chair Ziemer: That was more for conflicts right? I mean for all sites.

Dr. Lobaugh: The October 2017 paper is specific to Lawrence Berkeley, but it's a general approach for all workers basically who have had any kind of bioassay monitoring there. Because most of the bioassay monitoring is gross counting techniques. And then there's air sampling added in there that we will

discuss for an unmonitored worker dose assignment.

Chair Ziemer: Gotcha. Okay. So Joe, the October document which is listed under the second main discussion item, does that satisfy the questions you asked in the February 2014 memo?

Mr. Fitzgerald: Not directly, but I think what we interpreted the October 2017 White Paper to be was offering a broader, as Megan pointed out, a broader and somewhat newer approach to the question of how one would assign internal dose after '61 assuming that you do not have necessarily bioassays for all the workers that you'd be concerned about.

The issue is if you're going to do a coworker model, you want to base that on air sampling in addition to whatever bioassays you do have.

And we have looked at that as will that in fact do the job. Will that work. In terms of the hierarchy obviously you would prefer bioassay data for the workers that were in fact exposed to the internal emitters.

But if that data isn't necessarily complete or adequate could you in fact use air sampling information. But that's going a little lower on the hierarchy so a lot of our questions, and we did respond to that paper, revolve around whether it's representative enough and given the fact that it's not -- well, we can get into that.

To answer your question no, it's not directly responsive to the question of validating whether or not the bioassay data is necessarily sufficient and complete, but it does get to an issue of if it is not could one use air sampling information in the way that this paper proposes. And that's how we've

chosen to look at it.

We kind of have an open door on that. And we can get into that if you want, Paul, but I think just before we leave this issue the question that we has posed on issue 2, or finding 2 for the Work Group back in 2012 was the adequacy and completeness of the bioassay data post '61 and whether or not the end of the SEC, the cutoff period was the foreseeable time to cut it off, that the bioassay program was sufficiently mature, working, being implemented and was adequate to the source terms at Berkeley.

And we felt there were some real questions about that, whether adequacy and completeness was there and whether or not that '61 post -- end of '61 cutoff was necessarily appropriate.

And we still feel that way. Now, one can switch gears and look at air sampling as an alternative and look at the merits of applying that, but I think we still have the question of the adequacy and completeness of the bioassay as of the end of '61 and whether if in fact the premise for pre '61 was inadequacy, whether or not into '62 and beyond that now becomes adequate.

We think there was a time when the program was being ramped up. And it's not clear that after '61 it was necessarily adequate to the task of monitoring for the variety and diversity of nuclides at Berkeley. That's kind of where we came out on that.

Now, given that we have since then examined this question of using air sampling results. But as you can imagine that itself carries its own issues.

Chair Ziemer: Right. That will also -- those weren't breathing zone samples either. They were area

samples.

Mr. Fitzgerald: Well, we can get into that. But just as a broad perspective that's kind of how we have arrived where we are now. And that's kind of simplistic, but that's why we're talking air sampling now as opposed to bioassay because again I think NIOSH had considered a number of these comments and felt that it wanted to examine air sampling information as a basis for dose reconstruction. And we have tried to work on those issues.

But again, I don't think we really put the question of adequacy and completeness on bioassay completeness at that. And I think what Megan is saying, there may be a response, will be a response to that August memo and the original paper in the context of whether or not those issues can be addressed fully now or not.

So anyway, that's the backdrop.

Chair Ziemer: And the ramp up is kind of a step function. I don't recall, is there any indication that the ramp up was starting before 1962? The SEC goes through December of '61, does it not?

Mr. Fitzgerald: December of '61. Yes, I think --

Chair Ziemer: And how do you see the ramp up, the next day wasn't it a full --

Mr. Fitzgerald: Oh no, no -- and I think NIOSH did a good job of painting the history of how there were few bioassays before that and that it was very clear from documentation that they were putting the program in place and they were developing and getting it to run through '60 and '61. And that you could see evidence of the bioassays being collected

and the program operating by the beginning of '62.

Our question gets to beyond the programmatic documentation and what bioassays may or may not have been collected after that can you in any way validate the actual implementation after --

Chair Ziemer: Right.

Mr. Fitzgerald: And that's kind of what the Work Group charged us with looking at and that's why we provided the two documents that are listed, I think Megan listed in the BRS. We generated a September 2012 response as well as that August -- I'm sorry, February memo. Both getting to having to look at the data and having the data tell you what you can about implementation rather than focusing on the programmatic stuff, you know, the procedures, the guidelines, the guidance.

Chair Ziemer: Right.

Mr. Fitzgerald: -- concern that much of what we're reading is what Berkeley had proceduralized as far as the bioassay program, but not so much as far as what the results seem to be.

Chair Ziemer: Thank you. That's helpful. So, I'm trying to look at path forward here on issue 2. Megan, do you want to talk to that point?

Dr. Lobaugh: Yes. So, as I mentioned we'll provide a written response to that February 2014 memo and we'll provide within that response specific references to where we provided past information on specifically the mixed activation products and our responses to that 2012 paper as well as how the more recent White Paper methodology that we put out in 2017 would affect these questions or our ability to do dose

reconstruction with these questions in mind.

Chair Ziemer: Okay, very good.

Mr. Fitzgerald: Excuse me, Paul? While we're on the subject of the September 2017 paper since that's kind of where we are at right now do you want to spend time now -- I think it's actually in the second part of the agenda that we get into that. I guess we could get --

Chair Ziemer: I think -- this relates to finding 2 anyway. Is there some -- I see the October one. Did you say there was another one in 2017?

Mr. Fitzgerald: I think Megan would want to walk through her 2017 White Paper on air sampling. But we have since provided a response to that. That came --

Chair Ziemer: Is that the May '18?

Mr. Fitzgerald: Right. 2018. And then I know looking at the BRS Megan provided some -- I would say some reaction to responses within the BRS to that paper. So that's where we are right now.

Chair Ziemer: Yes. That was like October of 2018 I think. Yes.

Mr. Fitzgerald: Right.

Chair Ziemer: Yes, let's go ahead. That all ties in with issue 2.

Dr. Lobaugh: Okay. We'd like to go to the second part of the agenda on the White Paper. So this would be under -- for the BRS finding it's in a separate PDF. It's in the PDF that says Method to Assess Internal Dose Using Gross Alpha -- ABG Bioassay and Air

Sampling. So that's the BRS entries that we're talking about within that PDF.

So, in October 2017 NIOSH put out this dose reconstruction methodology on how we were going to analyze gross alpha, beta and gamma bioassay samples and air samples for Lawrence Berkeley.

To give you a better summary of that I'm going to ask if Stephen Spanos can speak more specifically about the document itself since I wasn't actually involved in the development of the document. He is our ORAU team HP who did develop that document. Stephen, would you be willing to speak just generally about the White Paper?

Mr. Spanos: Sure. Stephen Spanos, ORAU team.

The White Paper was -- determine the internal dose using gross beta, gross alpha and gross gamma bioassay using air sampling and bioassay for individuals that were monitored at Berkeley.

How much more specific do you want me to go into this other than I'd kind of like to keep it as general as I could and maybe get more specific questions than bog the Board down in the nitty-gritty detail of everything that I did. I assume that's what the Board wants to hear.

Chair Ziemer: Well, let's try it that way.

Mr. Spanos: Okay. So, what we did in general was we took all -- we compiled a list of all the radionuclides that we found at Berkeley, broke them up into all the alphas, the betas, the gammas. We used 95th percentile air sample concentration.

Based on the air sampling data we compiled in phase

2 you know, data compilation effort that we put together. The bioassay program was, we had the gross beta, gross alpha, gross gamma bioassay program defined as based on the information provided in responses and some of the other White Papers.

We broke up a list into the longer lived stuff that was likely to be picked up by the bioassay program based on the typical monitoring frequency and the rest were lumped into those -- likely picked up by air sampling.

And if an individual was bioassayed we would determine their internal dose based on bioassay and use the air sampling results to bound their intake based on bioassay if the results showed that the air sampling results were more limiting.

That's kind of it in a nutshell.

Dr. Taulbee: Paul, this is Tim. Is that a good enough description of the report, or were you looking for more?

Chair Ziemer: No, in fact I ask this question. So if an individual had bioassay information and you also had air sampling information from that location you compared the internal dose information calculated from each and can see how related they were?

Mr. Spanos: No, we determined intake rates based on bioassay.

Chair Ziemer: Right.

Mr. Spanos: The 95th percentile air concentration that was an annual average air concentration over all samples.

Chair Ziemer: Okay.

Mr. Spanos: For the site.

Chair Ziemer: Gotcha.

Mr. Spanos: Because the logic would be is if you didn't know where a person would work, you know, the general -- if the overall average air sample results. And we just used those to limit the bioassay. And in cases where they've limited the bioassay. In case where the bioassay was more limiting we used the bioassay. And that was shown in some of the examples in the White Paper that we did for this proof of concept.

Chair Ziemer: Okay, gotcha. Let me see if -- who wants to respond? Joe?

Mr. Fitzgerald: Yes. Actually, Bob Barton's still on the phone, he and Ron actually tackled the response to this White Paper and I think they can give you a summary of our review. Bob?

Mr. Barton: Yes, Joe, I'm here. Well, if you want maybe a good way to approach this is we had two findings and three observations from that review of the 2017 White Paper.

Maybe the best thing to do is sort of go through those one by one just like we did the previous issues. Ron, if you're on the line I know you were quarterbacking the first two findings and that first observation. So I don't know if you want to get started there or we can work backwards?

Dr. Buchanan: I'm on.

Mr. Barton: Okay, great.

Dr. Buchanan: This is Ron Buchanan of SC&A.

And the finding, we had -- like Bob said we had two findings and three observations. I guess I was the one that had the two findings and then Joe and Bob had the observations. So I'll cover the two findings.

So the way I understood this was our investigation showed that the bioassays perhaps were lacking at certain periods which we initially thought there was bioassay data after 1961. We found that these were sketchy at some times. And so what I understand NIOSH proposed using the data air sampling to determine what the intake may be and create a coworker model from that if there was bioassay data of course it would be used.

And so now, there's two issues here and this is finding 1 and 2. Number one, when you use air sampling data, does it represent what the worker actually took in. And finding number 2 was the gross counting.

Anytime you do gross counting and then you report it as a particular isotope and later on go back and extrapolate that to other isotopes it would be limiting for dose reconstruction. You get technical issues.

So finding number 1 has to do like so many of the sites, this is not a new subject, is air samples may not represent concentration for the workers.

And I guess the issues begin by the fact that in the White Paper it is stated on page 7 a number of references to the fact that air sampling may not represent the breathing zone sample or what the worker actually took in.

But then later on we use this data. And so our finding number 1 was concern with the fact that -- well, one

part was that breathing zone and work area and area sampling seem to be used interchangeably throughout the text. However, that's more of a nomenclature thing.

But it does have ramifications in that what were we using to derive the air concentrations. And so that was of concern to us because if you have an air sampler -- and of course it's very tedious to get air samples which represent what a worker has -- is taking in.

And this is a problem even like where you have reduction, like glove boxes, work stations, that sort of thing you have problems getting representative air samples. And so they used lapel air samplers later on and sometimes these were better than area monitors obviously. Not necessarily exact, but better than area monitors.

And so you really have three types of air monitors. One that's sitting over in the corner of the room. One that is found at either the intake or exhaust of a work area be it enclosed glove box or in a ventilation system or something. And then you have -- and that can vary depending on the work situation. Then you have the ones that are worn on the lapel. And it's to represent what the worker is actually taking in.

And so this is always a problem even at production facilities, but then at Berkeley it's even probably more of a problem because there you had a research facility, experimental facility. You had accelerators where it's very hard to determine what the air concentration is other than just general air.

You might set limits on saying well, we don't have a ruptured target or something like that by saying -- or spread of contamination by looking at your

continuous air monitors.

But to say what a worker actually got from an area monitor is really difficult especially around such things as accelerators, things that are changing all the time.

And then of course you combine that with the mixed activation products, many of which are short lived which you might not detect if you take the filter and let it sit awhile and then count it.

And same way with whole body counting. If you have whole body counting it has to be done pretty soon after the exposure if it's a short lived isotope.

So these are all issues we have with the breathing because we felt that in the paper, the White Paper that was issued in 2017 the reverting to using some air sampling data to fill in for lack of bioassay presented a number of representing patient issues. And so that was our finding 1.

There was a response. We issued our response in about May of 2018 to their 2017 White Paper and brought up some of these issues. And then Megan provided a response on the BRS in October 2018 and explained some of these things.

However, at this point -- at that point it was said that they would change some of the things in the TBD. However, we feel that maybe just changing the wording is not what we're looking at here. We're looking at how representative these air samples actually are of the intake.

And so that was issue -- or finding number 1. And so I guess before I go to finding number 2 I would let NIOSH have any response they have to this issue.

Mr. Spanos: Megan, do you want to --

Dr. Lobaugh: Yes, I'll respond to this, Stephen. Thank you.

So, as Ron said we responded in October of 2018 with a response saying that we do understand that the interchanging of words needed clarity.

But in addition to that we also provided justification for why the air sampling that we used can be thought of as breathing zone sampling.

So according to the implementation guide that we used for this program breathing zone samples are air samples that are representative of the air that a worker breathes. There is no requirement that they need to be lapel samples or in any specific location. They just need to be representative of the breathing zone.

The air samples that we used in this -- is there a question? Okay. The air samples results that we used in this methodology are marked as breathing zone within the LBNL reports that we used.

And LBNL had a policy of air sample placements. So LBNL had guidance on the placement of air samplers as early as 1951 and in that guidance they said to keep the air sampler as close to the scene of radioactive operation such as on the face of hoods or at the glove box.

So what this ends up resulting in is with an air sampler placed closer to the work than the worker is which the idea there is that the air sampler would capture less diluted air from the work.

We went on to explain how the air sampling

placement guidance that LBNL used in the 1950s and early on in the program, how that is in line with current day guidance and standards for air sampling placement.

And we also discussed how LBNL used these results. So, the limiting MPCs that LBNL used were 0.253 per meter cubed alpha and 100 picocuries per meter cubed beta gamma.

And we discussed how this was used in our paper here.

So, I think the takeaways here are we have committed to updating the White Paper with additional justification for why the air samples that we're using in this methodology are considered BZ to clarify our terms that we're using.

And we just want to ask whether there is additional questions or response to what we wrote up.

Chair Ziemer: Well, Ron, you may respond to that. Let me again clarify what were labeled as breathing zone samples. Clearly they're better than the general area samples. And some were even --

Mr. Katz: Can everyone hear me?

(Simultaneous speaking.)

Chair Ziemer: Something broke in there. Are we clear?

Mr. Katz: Yes. Are we clear of that line? And is Wade Morris an ORAU staff person?

Dr. Taulbee: Yes, he is.

Mr. Katz: Okay. Can you maybe get in touch with him

so that he knows about phone matters.

Dr. Taulbee: I believe somebody else was trying to call him.

Mr. Katz: I see. But there's still something wrong with that coming through here.

Chair Ziemer: It kind of broke in all of a sudden. Yes. So, then Ron, is SC&A's concern focused on whether the breathing zone air samplers or the so-called breathing zone air samplers are sufficient? Clarify the current concern now on this for clarification.

Dr. Buchanan: This is Ron Buchanan. Yes, so far we've seen that mainly the reliance on policy, procedures and guidelines. They said they'd do this, they'd say they'd do that.

There was only one actual documentation that it was done was a 1951 photograph.

And so as we've found in the past with many other things they could have the procedures and policies written down, but were they actually being done out in the field.

And so we feel at this point there is a question on while it was written down in their procedure books and such we don't feel that there's been really indication that the breathing zone was actually what was being monitored.

And this has been a problem at other labs too with breathing zone, using air monitoring. Does it equate to breathing zone such as Argonne National Lab West and Livermore Lab and Los Alamos and a number of others.

And so we don't feel at this point that really we can okay so to speak the use of air sampling. The air data itself might be okay. You didn't really have a problem with that. But what about representing what the person's actually breathing. And this was especially true around experimental facilities.

Some of this is based on production type facility and we're looking here at a lot of research type facilities. And I know from working accelerators you don't walk around with a lapel sampler usually strapped on to you.

And so our concern at this time is can again air sampling actually be used to assign intake for dose reconstruction in a situation for the period we're talking about at Berkeley.

Chair Ziemer: Well, the previous -- NIOSH also indicated the comparisons for bioassays and the air sampling. But that also became a bounding issue, didn't it? Can you do bounding with the air sampling?

Dr. Lobaugh: What more specifically do you mean, Paul?

Chair Ziemer: Well, was Morris the one who presented the discussion there originally on the October NIOSH memo? Was that Morris? Who was your guy there?

Dr. Lobaugh: Stephen.

Chair Ziemer: Oh, okay. Well, in any event I was trying to understand how they were using the air samplers. It seemed like they were putting bounding values that at least would be claimant favorable. Is that correct?

Dr. Lobaugh: Yes. So if there's bioassay data, the bioassay intake is calculated and then the air sampling data that we have for across the facility, the 95th percentile across the facility is then compared to that bioassay data and the more favorable is assigned.

Chair Ziemer: Whichever gives the highest or claimant favorable number.

Dr. Lobaugh: Yes. The air sampling results that we're using are across the entire facility and it's the 95th percentile of all those results we have.

One thing I want to point out -- well, there's two things I'd like to point out right now.

This data that we're looking at for Berkeley, if you have the White Paper in front of you it would be page 89 on that White Paper.

We provide table B-1 and B-2 with all of the results for the entire site for this entire time period. So we're looking at monthly -- basically what this table gives you is the uncensored number of results that we have in months, the total months that are monitored, and then the number of air sampling locations that are out there.

So like if you look in 1964 on this table there's 135 air sampling locations times 12 gives us this 1,620 total months.

So we looked at this on a monthly basis so that's how we got that 1,620 total months that were monitored.

And of those 1,620 total months only 26 of our sample results are uncensored meaning that they're greater than 1 percent of the maximum permissible

concentration onsite.

So we're looking at a very small number of samples that are positive and of those samples we're taking the 95th percentile. Because the censored results are then being censored at the 1 percent. So basically being imputed, sorry, at the 1 percent level.

Chair Ziemer: Right.

Dr. Lobaugh: We're even adding additional conservatism in there by taking out the zeroes and labeling them at the highest number they could have been. Highest result they could have been.

So we're not talking about very many positive air samples on this site at all. That's the first thing I wanted to point out.

And then the second thing I wanted to point out is in general for the entire program we're developing Report 97 which is a report that's going to discuss breathing zone air sampling versus general area air sampling.

And this was originally being developed specific to INL and ANL-West, but it is going to be developed for a program-wide approach.

Chair Ziemer: And that would go through I guess the Procedures Subcommittee wouldn't it for review.

Dr. Lobaugh: Yes. If it's overarching.

Chair Ziemer: Yes. Ron, what does SC&A need to see to be -- well, to work toward closing the site eventually? What do you need?

Dr. Buchanan: Well, one thing, and this is Ron Buchanan with SC&A.

I have a question or a clarification. The reason the air samplers data was used was not so much to limit or to compare it to the bioassay. I understand it was in place of bioassays because there was a lack of bioassays during certain periods. Isn't that correct?

Dr. Lobaugh: There is an unmonitored worker approach with the air sampling data as well, but there is a comparison against bioassay and the finding is claimant favorable.

Dr. Buchanan: But if they have bioassay we really don't need unless it doesn't show as much as the air sampling. But I guess our concern is -- the reason we're developing this is there was unmonitored workers enough that warranted the coworker model of some kind and this was taken from the air sampling data.

So I'd just like to clarify if the air sampling data is going to be used to assign intakes to a number of people that did not have bioassay data. So we are concerned it's not just a secondary tool, it's going to be primary for a number of dose reconstructions. So we're concerned about the representativeness of the worker intake.

And so I guess what we'd like to see is something besides procedures. I know at some of the other sites they have actually showed where the samplers were placed in relationship to the ventilation system and such.

So far we're not comfortable with the fact that the samplers were other than on paper that they should be placed in certain places. And so I guess our question is have they -- is there any documentation that shows that these samplers were placed, I mean specific instances, pictures, diagrams, air flow,

especially around areas that the worker could get intakes other than working at a hood.

Now, if you're working at a hood you've got an air sampler right there between the Plexiglas and the worker. Then that's good. That was that one figure showing. What about all the rest of them? Where were the samplers placed? How did they represent what air was taken in?

I guess that's the unknown at this point.

Mr. Fitzgerald: Hello, this is Joe Fitzgerald again.

I just want to add to what Ron is saying. What struck us is in looking at contrasting how this very question, the question of relying on air sampling to develop a coworker model was handled at other sites. It doesn't seem to us that the degree of scrutiny is being given on the Berkeley situation as it has at other sites.

If one is going to go to air sampling versus bioassays it ought to be a relatively high bar that one shows that the sampling process is representative. Because again you're relying on the conservatism of that value.

I did hear 95th percentile, but 95th percentile what.

The nature of the operations at Lawrence Berkeley, you're talking about fairly large experimental bays with accelerators like the bevatron. You can sort of look at the scale of those facilities and think about technicians, maintenance staff, experimenters working on pieces of this huge machine and taking targets in and out, looking for contamination, checking valves and pumps.

There's just certainly operationally going to be

instances where you're going to have the potential for puff releases, that kind of thing.

So the concern is even though NIOSH and this is how it's keyed in their document has a presumption that you would have representative BZ sampling by virtue of the guidelines and guidance that Berkeley has put out. Certainly the concern would be whether in reality, given the nature of the operations, how workers worked around the accelerator doing the work they would do in different parts of the accelerator, whether the sampling regime, the location of the samplers, the air flow, whether anyone had analyzed air flow for that facility, whether there were regular evaluations, air sampling evaluations of air flow and representativeness.

That would be important to have confidence that this presumption that NIOSH has on the representativeness of these samples is in fact the case at all of the facilities at Berkeley.

Undoubtedly if you were to lump them all together and do a 95th percentile you'd be striving to have a degree of conservatism. But if the situation was one where it would be difficult to sample whatever that technician or experimenter was being exposed to doing whatever manipulation they were doing on the accelerator by virtue of an air sampler located on the wall 50 yards away, whatever, then I think that's the issue that we need to resolve.

And there was mention of portable air monitors being used. That would be helpful, but there's absolutely no background or history on how they were implemented, applied, and whether in fact they were used for these kinds of situations where you were doing individual maintenance or monitoring or

decontamination or target removal from the accelerator.

So this is the kind of thing we're after. It really needs to be evaluated because you are moving from bioassay to relying on something that may or may not be a representative air sampling system.

And there's got to be a way to know one level lower whether in fact you're obtaining adequate and accurate data, air sampling data so that the coworker model in fact would be valid.

So that's kind of the root of our concern goes back to I think our original concern that we expressed in the preceding documents that something as fundamental as a coworker model has got to be founded on something more grounded than a presumption based on the procedures and the guidelines that the laboratory may have issued to one where you're actually looking at some hard data. So that's kind of in a nutshell what I would say.

Chair Ziemer: Well, that helps clarify what SC&A is interested in looking at. Do we have specific information on locations of the air sampling devices that were in the facility?

Dr. Lobaugh: We have I think rooms and information like that. What we used to compile this data would be the monthly reports. So it's the information that would be available to us in the monthly reports.

Member Clawson: Hey Paul, this is Brad. If I could mention something. If we remember what happened at Pantex with kind of a similar situation like this where when we actually made the tours down there and could find out where the air sampler heads were at, they were 2 to 3 feet from the exhaust plenum.

The only thing you would have picked up is a catastrophic event.

And that's why this also is so important that we know where these heads were at at the time that they were done, not down the road but where they were at at the time that they were being taken.

Mr. Fitzgerald: This is Joe Fitzgerald again. I'd just add to what Brad said. This very question, this is not a novel question. This question has come up as Ron pointed out earlier at least at Argonne-West and at Livermore in those SEC discussions. And both sites had plenty of air sampling data available for rooms and facilities at those sites.

And the question came up with the lack of bioassays could one develop a coworker model, or make use of the air sampling data. And the question of BZ versus general air sampling has come up at the -- it wasn't pursued because the concern was there wasn't sufficient evidence that in fact you would have representative air sampling information, that it wasn't sufficiently BZ in nature, breathing zone in nature.

So at the very least I would like to see a crosswalk of how that issue has been addressed and the extent to which the basis for the air sampling program itself, the actual sampling times, the air flow rate, things that would bear on whether or not the samplers would see the source terms that we're talking about and in fact represent BZ for a technician or a maintenance person working on the accelerator, for example, specifically. That would be useful.

Chair Ziemer: Megan, do we have information where you have actual bioassay data and have compared it with what you would calculate using the air samplers?

Do we have any indication of whether bioassay samples tend to be higher most of the time or lower most of the time? If you do the comparisons.

Dr. Lobaugh: There are examples within -- sorry. There is examples within the White Paper, but are you meaning have we looked in general at all bioassay samples comparing it to this?

Chair Ziemer: Yes. You know what I'm saying? So, do the air samples tend to usually exceed what you would find in an actual bioassay calculation where you have both bioassay and air sampling data? Or does it tend to be the other way? I know you can have both, but overall. Does one tend to be more claimant favorable? Just trying to get a feel.

Dr. Lobaugh: I'm going to ask if Stephen could talk about that, the more general, if we looked at general --

Chair Ziemer: All the cases where you have both, both numbers. The bioassay and the air sample for an individual.

(Simultaneous speaking.)

Dr. Lobaugh: So, any individual that we have a bioassay sample for we would use the same air sampling result for.

Chair Ziemer: Yes, right.

Dr. Lobaugh: But Stephen, could you speak about the more general review, if we've looked at the bioassay results in general compared to the air sampling results.

Mr. Spanos: Stephen Spanos here. In terms of

looking at specific bioassay results, no.

However, the White Paper methodology example that we provided was for an individual who received missed dose, where he received bioassay and it was just below the MDA.

And then if you look at the example calculations that we ran through there, most cases the air sampling is more limiting. And one of the reasons why the air sampling is more limited for Berkeley is Berkeley established very low air sampling limits for the workplace because they could not stand technical contamination. It was documented in one of those earlier references maybe around circa 1951.

Technical contamination could ruin weeks of work so their air sample limits were several orders of magnitude lower.

And as a result, by virtue of the air sampling program being so restrictive and the results show that in the White Paper if you look at 97 percent of the data was censored.

Now, it doesn't mean that they didn't see anything below that. They did. It's just the bulk of the data we used were these monthly summary reports that were an efficiency measure and they showed that they only reported results above 1 percent of the MPC.

(Simultaneous speaking.)

Mr. Spanos: When you drive your air sample results down by the fact that you have lower limits that you're going to have, most cases you're likely going to have the air sampling be limiting for the cases of missed dose.

(Simultaneous speaking.)

Mr. Spanos: -- the example.

Member Clawson: This is Brad speaking, Tim. So, you're using air sampling data but they were worried about their processes, their technical part of this versus this was not set up for the individuals. This is not something new. We've run into this at numerous sites.

And I just, I don't -- I don't feel good about it. You can say whatever you want. You're still taking a process and you're saying well, because they did this and they did that in these papers, this is good data. Here today I don't feel that good about it.

Till you can prove to me where it's at, what it was there for, air flows, everything else like that I don't think we can really use it.

Dr. Taulbee: Paul and Brad, this is Tim. So if we went through and documented better where these air samples were taken to give the demonstrations of those that were on the hoods that would be between the worker and the source material, that type of information, would that help you in understanding why we believe that these are BZ or breathing zone or better than breathing zone as far as protective. Would that help?

Member Clawson: I'd like you to be able to prove to me that they are better because, Tim, we have been through this before and come to find out that when we actually put hands on and looked at that it was not what it appeared in the papers.

(Simultaneous speaking.)

Dr. Taulbee: What I was getting at there, Brad, is that I mean where we've got an air sampler on a hood and the person is working with material in the hood and the air flow then was coming from the person into the hood, anything that would be potentially coming out from that standpoint the sampler is closer to the source than the worker is. That's what I'm meaning by better than BZ.

Member Clawson: Well, and I understand that, Tim, but you're using air samplers throughout the whole area. You're using it in areas, large areas to be able to basically -- let's just be honest what the sampler is for was to catch incidences or any releases.

And the majority of this was, quite truthfully it was to catch if we had an event there.

Now, some of them you know -- I'm not saying that this is not good data, but what I am saying is that I need better clarification of why this is good. And we have seen this at numerous sites. This is nothing new.

Dr. Taulbee: I understand and that is part of why we are developing a special report to help address the Argonne-West issue that Joe had brought up as well which is not closed yet by no means.

And that's why we're developing a complex-wide type of approach of the BZ versus general area air sampling in small rooms or confined areas or in this type of scenario. And so that's one --

Member Clawson: You just brought up something, a small room.

Dr. Taulbee: Yes.

Member Clawson: Okay. That makes, you know -- let's just be honest. We're going to have to see what you guys come up with, but right now I'm not satisfied with what I'm seeing.

Dr. Taulbee: And I'm trying to figure out what more information we can provide that will help that. That was the purpose of my question.

So if we were to go through and provide more information about the location, about the source term and these results, air flow, if there are studies, smoke studies, that type of thing, a report or a White Paper or beefing up this White Paper about that, that would help you?

Member Clawson: Yes, that would. This was how we had to put it to bed at -- I'm thinking of all the different sites that I've been involved with. Even Kansas City. Pantex was a big one.

Mr. Fitzgerald: This is Joe again. One thing that would be helpful just to be responsive to Tim's question.

You know, all facilities will run room ventilation air flows. If you have an air sampling system that's just something that you would periodically do just to ascertain whether or not the samplers were effective and whether or not you're getting representative sampling of the work area.

Tim, certainly one thing that would help is just being able to see what Berkeley may have done in that time frame. I'm not talking about the two thousands, but back in that time frame in the sixties or whenever, and that's a rough time frame, what did they do to look at placement from the standpoint of air flow and representative sampling.

The placement of the samplers themselves doesn't tell you necessarily what you need to know. It's whether or not they in fact would capture the -- what the workers would be breathing in.

And again I'm concerned because the nature of activities. They're episodic and dynamic which is the term that was used in the Livermore SEC where it was decided not to use general air sampling results for that reason.

And I don't see the big difference in terms of the -- whether or not Berkeley wasn't similarly dynamic and episodic in terms of what exposures they may have had from the accelerators.

To have the analysis at Livermore come out that there was insufficient information to link the air monitoring results to work areas because of the episodic and dynamic work that was associated with the laboratory's analysis, that sort of gives me pause.

Okay, that's kind of the same question that we're trying to grapple with.

So I would also look at -- you are doing that in your general reassessment of GA versus BZ, but just the consistency of how that is tested and whether the so-called test is actually consistent across sites would be useful in this regard because I think that's part of our hiccup is that it doesn't seem like the degree of validation on that question is the same. Should it be the basis for a coworker model? Certainly the validation should be similar and it doesn't appear to be.

So that would be where I'd be coming from, that if one is going to use air sampling as your fallback for the coworker model certainly one would be cautious

about looking at those issues and try to find some validation beyond the guidelines, Berkeley guidelines that demonstrate that you have a situation where you can rely on those air samples for representativeness.

Chair Ziemer: Thanks, Joe. Let me suggest something here at this point. We've had a fair amount of discussion. Obviously more work needs to be done to get both sides lined up here a little better.

I'm wondering if we couldn't ask NIOSH to give some additional thought based on the conversations here today to address some of these things that have been raised. You might need to sort of plan a more specific strategy based on what you've heard and see what you can do to flesh this out a little more.

And maybe -- might have to have additional give and take like we did earlier between NIOSH and SC&A to come to some point where there's a better comfort level on the use of the air sampling data.

Looks like it becomes sort of a coworker type model, but we need to have some consonance in the approach that's being used.

I don't know that we can specify a path forward exactly right now, but I think NIOSH, you heard a lot of comments here and maybe give some thought on how to approach it.

Dr. Taulbee: Right. Thank you, Paul. What I believe our approach is, and Megan, correct me if I'm wrong here, but we're going to be revising the White Paper.

And so I think we're going to include some of these points that SC&A has raised and provide some -- hopefully be able to provide some more information

about the placement of the air samplers. And not just from the guidance as Joe just pointed out, but actual examples of the major areas and try to incorporate that into a revision to the White Paper and then provide that back to the Work Group.

Chair Ziemer: Okay, thank you. Let's proceed on that basis then.

Now, I need to find out if anybody needs a comfort break at this point. I think all we have to really address yet is 4. If anyone needs a comfort break I can take it, or we can proceed. Anybody?

(Simultaneous speaking.)

Chair Ziemer: What's that?

Mr. Katz: I think we don't hear anyone crying for a comfort break so I think we should just soldier on.

Chair Ziemer: I think -- let's finish up with issue 4 because 11 and 12 get taken care of if we get 2 and 4 taken care of. So let's finish up with issue 4 and then we'll be ready to call it a day I think.

Dr. Lobaugh: We still have the other finding and observations for the White Paper. Do you want to go through those or not?

Chair Ziemer: Well, yes, let's see. Yes, let's finish that up. So, let's see. Was Ron doing that? Or Joe?

Dr. Buchanan: This is Ron. Finding 2 was mine. And that was concerning the White Paper that was issued in 2017. And this is for -- there is gross counting data for bioassay and for air sampling.

And so at that time they took gross alpha, beta and gamma data on a counter and recorded it as a

microcuries per liter or whatever the results were recorded as.

And to do that they had to assume that it was the strontium-90 or it was cesium-137 or americium-241 or whatever because they had their detection unit set up for that in the lab.

And so if you take a sample counter you get a count rate, you convert that to dpm or microcurie you have to assume some efficiency, some isotope and you have a certain calibration standard for that detector.

And so our concern in finding 2 was -- so when you go dose reconstruction and you have gross counts, you don't have specific information on what that isotope was. It might have been counted as strontium-90 but it could have been some other isotope because there was such a wide variety of stuff earlier that Berkeley had such a wide variety of radionuclides that the worker could have taken in a variety of different nuclides other than this strontium-90 say that was counted on his record.

And so in dose reconstruction the way they approach it is they look at all the possible radionuclides and what the cancer is and assign the one that was given the highest probability.

And so this gives a lot of possibilities, a lot of solubility types and everything in Berkeley.

And the problem is that if -- was a person who was exposed to something other -- a beta emitter besides the strontium-90 the counting efficiency would be different for that, especially if it's lower energy for beta and for gamma it works in reverse, the higher the energy the less your efficiency. And so there's a lot of self-absorption and backscatter, that sort of

thing that has to be considered.

And so our question was, okay, how can you assign an intake to be most favorable to the radionuclide for that cancer if you don't know what it was to begin with. And if you assign worst case scenario how do you know the counting efficiency.

And so that was our question. And then Megan provided a short response but I'll let her discuss how they plan on addressing that issue.

Dr. Lobaugh: Yes. So the first thing I'll say is this is -- in our view of it this is a lower priority than the response to the first finding. So we are just proposing a path forward and we haven't done any work on this part yet.

But we're proposing that we would research the site-specific detector system information and efficiency calibration information for LBNL. If we can't find site-specific we would use a general assumption for the time period.

And we would determine if accounting for the efficiency makes a significant difference in the assigned doses in the end, and update the DR methodology appropriately if that is the case.

So we have a path forward but as I said the higher priority as we see it is finding 1. So that's where we have put our focus and probably will put our focus going forward.

Chair Ziemer: Okay. Let me ask for comments. Is Dave back yet?

Mr. Katz: Dave is back. He may not be speaking up, but he emailed me that he was back.

Chair Ziemer: Yes. So, there's a proposed path forward and let me see if SC&A has any other comments on that.

Dr. Buchanan: Is this on finding 2 in general?

Chair Ziemer: Finding 2 I think was what we're talking about, right?

Dr. Lobaugh: Finding 2 for the White Paper.

Dr. Buchanan: The counting efficiency. Yes, that was my finding and I feel that that would be a proper way to address it and move forward.

Chair Ziemer: Well, it makes sense to me. I just wanted to see if any of the Board Members had comments or questions, or if SC&A understood the proposed path forward and if that would be suitable for making progress on this one. It seems fairly straightforward.

Member Clawson: Paul, this is Brad. I'm good with that.

Chair Ziemer: Yes. Good. Okay, we'll proceed on that basis on that second finding. You want to say anything on the observations, Ron?

Dr. Buchanan: Well, let's see, that was Joe and Bob so I'll let them discuss anything.

Chair Ziemer: Oh yes, right.

Mr. Barton: Okay, this is Bob. I think these are fairly straightforward, but certainly we need to discuss them.

Observation 1 and I think this really just came out of we had gone through the Site Profile and sort of

compared the potential radionuclide lists that were developed in this air sampling methodology that NIOSH put forth as a coworker method against radionuclides of interest that were listed in the TBD. And I think there was some discrepancy between the two documents and we pointed out two examples of that in our observation.

And I see you've got this response here from NIOSH that's specific to radioiodine but also some of the other contaminants of interest that we had seen -- again, we had seen them in the TBD but they don't appear in the methodology of the air sampling dose reconstruction proposed method.

So I guess with that sort of introduction I guess I'd hand it off to Megan to sort of update where they are on that particular observation.

Dr. Lobaugh: Yes. So we have agreed to include the two isotopes that were mentioned in the White Paper methodology update that we make and correct the typos that were ultimately found through this review in the Site Profile. There were two radionuclides listed in the Site Profile that don't exist. So we'll correct those typos.

And for the radioiodine they weren't included because they would not be captured in the air samples themselves. They would have been done via charcoal method. So that's why the radioiodines weren't included.

So this is again just update of the White Paper.

Chair Ziemer: So you're good on that, right? No need on that to take action. They're just observations. You want to move on to the second one?

Mr. Barton: Yes, we can move on. I did have a couple of questions.

Chair Ziemer: On the first one?

Mr. Barton: -- close those out, yes. On the first one the NIOSH response states that radioiodine because it can't be detected using essentially these air samples it wasn't included. Is there a separate method currently available for dose reconstruction for those radioiodines?

Dr. Lobaugh: Yes. So the bioassay, there's bioassay specific to radioiodines so that's how they would be captured there.

Mr. Barton: How would that work for an unmonitored worker?

Dr. Lobaugh: For an unmonitored worker that's a good question. I'll have to get back to you on that one.

Mr. Barton: Okay. And then the other comment I had was you noted that two of the elements that were in the TBD actually don't exist and you're right. I looked them up myself. But I'm guessing -- you mention they were a typo. I'm wondering is it appropriate simply just to delete them, or are they a typo in that they should be representative of a different isotope. The typo wasn't putting them in there, but by simply deleting them could we be missing what the intended contaminant was originally supposed to be in the TBD.

Dr. Lobaugh: I will investigate that. I can't say that I know for sure that they were typos. And like you're suggesting maybe not another nuclide. So I or NIOSH, we will investigate that and make sure before

we delete it that there was not another intended radionuclide.

Chair Ziemer: Yes, that's a good point. Okay. Ready for observation 2?

Mr. Barton: Sure. And observations 2 and 3 are really essentially tied together. And these really come down to how this proposed method would actually be applied in practice. And it mainly comes out of this quote from the NIOSH White Paper which is on page 6. I'll just read it into the record now.

It says, "Bioassay requests were generally made either once or twice per year for each employee in the bioassay program. Workers who worked with or in areas that contained unsealed radioactive materials typically received bioassays. Therefore, based on the typical LBNL bioassay monitoring frequency a single bioassay result indicate that the worker had at most one year of internal exposure potential before the date of the bioassay.

"All other employment period was no bioassay indicate a potential exposure to environmental levels only."

So this is essentially how are you going to use this method if it's approved in an actual DR context. And the way it was originally written which it seems may not actually be the intended case is that if you were a worker and you had at least one bioassay in a given year then you were considered a radiological worker and you could apply the air sampling methodology.

And if you didn't have a bioassay in a given year you were considered not a radiological worker and you only get assigned ambient environmental intakes.

Now, in the examples that were provided in the actual White Paper this didn't really appear to be the case because in the examples we saw you had workers, again these are example workers, who had just partial monitoring. In other words a part of the covered employment showed bioassay, but not all of it. However, even in those cases even if you didn't have a bioassay in a given year NIOSH still used the air sampling approach as a coworker model.

So the way it's written here it sounds like if you didn't have any internal monitoring in a year you would be assigned ambient only, but that wasn't the case when we actually looked into the examples that were given.

And in Megan's response she clarifies that the examples are representative of what's intended for the dose reconstruction process. So that language would just have to be updated and the instructions clarified that if you were monitored internally essentially even once during your entire employment that you would be considered a rad worker and the air sampling method again if approved would apply to that worker.

And if you were never monitored internally whatsoever I believe then what would be done, and maybe this is a point of clarification, but I guess what NIOSH intended if you weren't monitored at all internally you're not considered a rad worker and thus would not be given unmonitored intakes based on the air sampling approach.

Megan, did I sum that part up pretty well?

Dr. Lobaugh: Yes, that's correct.

Mr. Barton: I guess the only question on that would be if you run into a situation where you don't have

bioassay records for an individual, but the job title or statements made in the CATI or any other information or even just simply positive external doses or things of that nature.

I believe your response also says that that would be considered evidence that the person was a rad worker even if they didn't have a bioassay result. Is that also on point?

Dr. Lobaugh: It would be considered, yes. And then as you said unmonitored rad worker would be assigned the White Paper methodology approach and others determined as non-rad workers would receive environmental dose only.

So basically it's the decision of a rad worker versus a non-rad worker for LBNL.

Mr. Barton: Okay. So I mean, similar to other sites where if you were -- essentially never entered rad areas, if you were purely on the administrative side then obviously it's appropriate to only assign the ambient environmental.

However, if there is a potential to even periodically enter rad areas then you would essentially be considered a rad worker?

Dr. Lobaugh: Yes.

Mr. Barton: Okay.

(Simultaneous speaking.)

Mr. Barton: Oh, I'm sorry, go ahead.

Chair Ziemer: Well, I was asking is SC&A suggesting that they add some words to clarify that?

Mr. Barton: Yes, I believe that was part of NIOSH's response, that they needed to clarify these different points on how -- it's accepted this air sampling approach would actually apply to individuals in practice. So that's part of their response.

Chair Ziemer: You're just trying to understand what it really meant in terms of the present wording.

Mr. Barton: Right, right. Essentially changes, more specific instructions are going to be made. I just wanted to get a sense of what those specific instructions would entail. So yes.

The second part of this is again sort of comes back to this which somewhat puts to rest the previous discussion, but the bioassay requirement we took a look at because obviously that has a high bar for validation as use -- to even include somebody in a coworker model.

Obviously we just said there's a lot more to it than just having a bioassay in a specific year.

What we did is we basically looked through available bioassay records that had been captured by NIOSH and are available on the SRDB.

And then we went through those records and pulled out claimants. Said all right, we see that these claimants have bioassay in these captured records. Let's go see what we're actually getting from DOE when requests are made for an individual's dosimetry file.

In other words are the bioassays we're seeing here in the captured records being correctly ascribed to the claimant and being forwarded so that in a DR context these type of decisions can correctly be

made.

And obviously this sort of goes back to discussion on bioassay completeness.

So what we did is we took those claimants we could identify, went to the DOE files and basically it was either yes, the bioassay record is correctly in the file or no, it's not.

I think we found that overall roughly I'd say 20 percent were missing at least some bioassay records. Or I think, yes, somewhere about 37 or 38 total workers were missing them. So we said well, that's really not good. Even though sort of the criteria of how you're going to apply this air sampling model is much broader than we originally thought based on our reading of the White Paper, is there a problem here with correctly getting these bioassay results attributed to the claimant for the purposes of dose reconstruction.

I guess that sort of sets up the issue. I know that's kind of the bulk of the response provided by NIOSH so I guess I'll step back and let Megan sort of explain the investigations they did into that issue.

Dr. Lobaugh: Okay, thank you. So, the first thing I want to just talk about is some history of the LBNL claims records and what we know, what we knew going into this and what we now know and what we've done.

So in 2010 it was found out that the occupational X-ray information, so not related to bioassay, but X-ray information was not being sent to NIOSH. And we need this as part of the exposure assessment.

And so in 2010 we started receiving the DAR which is

document acquisition request which is the Department of Labor part of these records requests.

And this DAR includes the medical record, industrial hygiene information, human resources, a lot more information than what NIOSH may receive when they make their dosimetry records request.

So in 2010 we started receiving DARs that included the medical information so that we could get that occupational X-ray information.

What we know also is that in this medical file is typically either a copy or sometimes maybe early on the bioassay records and that's the only record of the bioassay records is within this medical file.

And this I think is just because of how LBNL had their internal dosimetry program set up at one time.

So, in 2010 we began receiving these -- basically the medical file, we'll call the medical file within that DAR.

The records that SC&A reviewed were all pre-2010 so they didn't necessarily have this medical record information which would have contained some of the bioassay records.

So in their review they maybe saw that bioassay samples should have been in there based on the introductory letter that is attached by LBNL or DOE to the dosimetry records where it says there are bioassay samples but no bioassay samples are included, or from SRDB documents that contain internal dosimetry monitoring and then that monitoring was not included in the claimant record.

So since 2010 we're receiving the DAR which includes the medical record, medical file. So since 2010 we've

found that we are receiving all the dosimetry information we should be receiving and are expecting to receive.

So for this pre-2010 time though we were still lacking the medical file for a lot of our cases. So I think there were about 120 or so cases, claims that did not have the medical record.

So for pre-2010 we actually did a mass re-request of all of these claims to be re-reviewed by LBNL and the medical file sent to us. So this began in January. We were in talks in the fall with LBNL about how this would go.

So in January they actually began sending us these re-requests. And so we prioritized them and we've already received the first 25 of these about 100 claims, 120 claims with the medical file now.

And then we will receive the rest, I think there were 50 or so that were likely tied to visitors so there was no medical file. So if you were just a visitor to LBNL you likely wouldn't have entered into their occupational medical program there so there wouldn't necessarily be a medical file.

So, so far we've received technically responses on about 75 of these pre-2010 claims. And we'll receive the rest over the next few months. This is a big undertaking for them, for the site itself to be able to re-review all of these records and send them to us. So we are currently awaiting to hear how they would like to proceed with sending the rest of the claims that we requested.

So, basically in summary we've re-requested all of the pre-2010 records that would be missing the medical file so that we could do a revised dose

reconstruction and make sure we have all of the dosimetry data that we know about.

And with this change that happened in 2010 of receiving the medical file and reviewing CATIs and information like that we think that we will be able to determine rad worker status for these LBNL employees.

Mr. Barton: Okay. I guess for SC&A's part I guess the only thing I'd see moving forward -- and I think there was really some good research to get a handle on what we were seeing with sort of these missing bioassays in the worker files.

One thing we could do since NIOSH is already re-requesting those pre-2010 records and SC&A has found again, we looked at 36 claims we were able to identify and 7 of them did not have the bioassay data in their file. Another 6, so 13 total had incomplete in that we knew that they had more bioassay results but we weren't seeing them.

So if those file requests are being made one thing we can do is go back and look at those 13 claims where we had identified issues and see if those are now essentially solved by the new processes.

Requesting the expanded file from DOE so that you're getting the medical records along with the standard I guess dosimetry response.

The only thing I would propose as far as a path forward on it would be to sort of use the previous test which found some issues and put it back up against the re-requested records and see if that really clears up the issue.

Chair Ziemer: That sounds good, doesn't it? You'll be

okay with that then, Bob, as you proceed?

Member Clawson: This is Brad. I'm good with it.

Chair Ziemer: Okay. So that will take care of that final observation. We won't close the -- we have to close observation 2, don't we, Ted?

Mr. Katz: Yes, we generally do.

Chair Ziemer: Yes. So that will correct when we see the final information.

Mr. Katz: Yes.

Chair Ziemer: Let's then finish up with 4 which also deals with bioassay I think completeness and adequacy. So let's see. What did we have. I guess we can start with NIOSH on that. Megan, do you want to?

Dr. Lobaugh: Yes. So one question I have just in general here is because of the overlap with 2, 4 and 11 and the fact that we've provided combined responses I don't know how you -- the Work Group would like to track these.

Do you want to track them all under one finding or separately? If we track them separately then there might -- I would need some help to determine what is considered with finding 2 and what is considered with finding 4. So that would just be my general question first off.

Chair Ziemer: Well, what would be most convenient for you? Let me ask that. Does it work better -- since there's a lot of overlap work better to combine them all into one, sort of one finding?

Dr. Lobaugh: I would suggest given the way

responses have gone in the past with combining the issues together in the responses that the tracking of them together would be easier then, just because of the past responses that combines them already.

Chair Ziemer: Well, let's do that. Then the question is for issue 4 are there additional parts of that that need to be raised that haven't already been discussed.

Dr. Lobaugh: I would ask for SC&A to speak on that. What I would say is NIOSH's understanding of this would be that the February 2014 memo is what needs to be responded to right now. So the same memo that we were discussing before under issue 2. I would say that NIOSH sees that we need to respond to that memo.

Chair Ziemer: Let me simultaneously ask -- well, let's see your answer to that and then I was going to ask SC&A the same question.

Mr. Fitzgerald: Yes, I think that's a reasonable approach. You really have the fundamental question of data completeness and adequacy which were raised in that earlier time frame and sort of was recapped in the February 2014 memo which I sent.

We had subsequently asked for and received all the SRDB citations that NIOSH felt provided a basis in terms of bioassay information. And it ended up being thousands of pages.

And we actually did screen through those, scanned them, and we came up with a series of questions that point to the issues of adequacy and completeness of that data as reflected in those SRDB citations.

So, yes, there's a fair amount of work in that that is

actually related to but not the same as where we are in terms of considering the air sampling proposal. So it would be very useful to go back and try to address the basic questions of adequacy and completeness of the data post '61 which I think is a very fundamental question in addition to looking at air monitoring as a coworker approach for the post '61. So I think both those need to go in parallel.

And certainly the data completeness and adequacy need to be addressed as a condition for even considering the coworker. That would certainly move us to want to get back to that and answer those questions now.

Chair Ziemer: So, what needs to be discussed now? What has been left undiscussed in the issue 2 part that we have not covered? Is there any new parts of this that need to be raised? Well, SC&A and Joe, in your mind have we raised all the issues that would apply to issue 4 in our earlier discussion of issue 2.

Mr. Fitzgerald: Yes, but -- to answer the question I think will take a little bit of effort just to look at the bioassay data post '61.

I raised earlier in our conversation today that there's a clear basis for deciding that the end of '61 is fine as a cutoff.

Chair Ziemer: Yes.

Mr. Fitzgerald: Because of the program being implemented. So we really do need to examine whether that premise is in fact validated by the data. And that's what this is about.

(Simultaneous speaking.)

Chair Ziemer: We already raised that question though.

Mr. Fitzgerald: We haven't answered the question. We certainly have looked at the bioassay data. And I think there seems to be some convergence that it's not as adequate as we'd like it to be and therefore that's why air sampling data is being considered as a coworker basis.

But it sort of begs the question going back to '61 that if the data is not adequate then we need to address that head on, how adequate is it, what's missing and since that's going to be combined with air sampling as the overall dose reconstruction approach what's the -- I think Ron raised this earlier.

Is it predominantly going to be air sampling basis because there isn't that much usable bioassay information or what. We don't really know that, or I couldn't glean it from what we've done so far.

I think this is what Megan's talking about in terms of responding to our February 2014 memo specifically on that question. And that will I think help us understand where air sampling is going to fit in and if in fact it's going to be the primary basis for dose reconstruction of internal doses post '61.

It sort of ties it all together. I think we skipped ahead a few years ago to get to this air sampling as a method, a proposed method. And it didn't quite cross the t's and answer the question about what is the completeness and adequacy of the data since we did -- or NIOSH did pick the end of '61 for the SEC.

Is it that much better in reality even though the program documentation suggests it is? That would be the answer I'd like to see.

Chair Ziemer: Well, that could still be answered in a combined fashion with issue 2 I think.

(Simultaneous speaking.)

Mr. Fitzgerald: Although I could say the question of adequacy is the hand.

(Laughter.)

Chair Ziemer: Yes. But putting them together you can think of both parts of this. It's still the issue. Each one is sort of half of the issue. But they've got to be handled in parallel. So we're okay in putting them together as far as tracking and so on.

I think the issue, the two issues have to both be addressed, but they sort of -- to look forward they can be addressed together probably. I'm really asking are there any new issues or any parts of them that need further discussion today that we haven't already covered. I felt like we had raised the issues that needed to be covered in both cases. If there's other questions that we want to emphasize or speak to we should do that now.

Megan, are you okay -- I mean okay in the sense that you have a good feel for what questions have been raised here?

Dr. Lobaugh: Yes, I do.

Chair Ziemer: Okay. Any further comments from the Work Group Members?

Member Clawson: No. This is Brad.

Chair Ziemer: And David's not back or is back? Apparently not back.

Well, we have proposed paths forward on the items that haven't already been closed so I think we're in good shape there.

So item 3 which is Work Group recommendation comments or follow-up. We've basically done those as we went along in terms of the follow-up and the path forward.

So let me ask if there's any other comments or questions that any of the staff people, SC&A, NIOSH, or Work Group Members have.

Work Group Recommendations/Plans for Follow-up

Dr. Lobaugh: Paul, I do have a question.

Chair Ziemer: Sure.

Dr. Lobaugh: For the observations on the Site Profile would you guys like to go through those quickly? What I could propose if you don't want to just talk about them now is we could -- NIOSH could provide a written response to the observations. Because I don't know if we've discussed those in the Work Group at all.

Chair Ziemer: The observations in the October -- actually, they were in the April 2018 document.

(Simultaneous speaking.)

Dr. Lobaugh: No, actually for the Site Profile.

Chair Ziemer: Oh, the original. Okay.

Dr. Lobaugh: Yes, the original --

Chair Ziemer: Yes. Yes.

Dr. Lobaugh: -- with the eight observations.

Chair Ziemer: Why don't you speak to those.

Dr. Lobaugh: Okay. Let me pull up the document. The observations begin on page 48 of the BRS entries PDF document.

And from what I could gather it looks like these haven't been discussed before so this will probably be the first time we are hearing some of these.

But the first observation has to do with the fact that the LBNL Site Profile does not address LBNL staff that have been assigned to other DOE or AWE sites like the Nevada Test Site.

So, the initial finding is basically just that, that LBNL Site Profile doesn't discuss about what to do if an employee has a visitor or work at other sites.

And what I would say the NIOSH response to this would be is that when any EE, so this is across the program. This is how we would handle it for any site. When any EE has been identified as working or visiting other DOE or AWE sites the monitoring records from those sites are requested.

So this is if we see something in a CATI, if we're provided records either through that DAR that I spoke about before or some other means via the SRDB lookup that happens automatically where files get attached to the NOCTS claim.

If we see something that shows that that worker could have been at another site we request those records from that site.

And then the assessment of those monitoring records

are covered under the applicable site's Site Profile.

So the LBNL Site Profile would not discuss those other sites. We would go to that other site's profile to actually assess the results.

Chair Ziemer: Doesn't that happen at every location anyway?

Dr. Lobaugh: Exactly. This is a program approach. This is, yes, exactly how it happens.

Chair Ziemer: I mean, there's nothing different at Berkeley than it would be at any other DOE facility. Right?

Dr. Lobaugh: Correct.

Chair Ziemer: So, I think SC&A just wanted that to show up. Was that the -- I didn't see anything different than what would always occur anywhere.

Mr. Fitzgerald: I just think it was silent in the profile. I think just to clarify that was the case.

Chair Ziemer: So really just to add some words that would do that, or clarify that perhaps. Is that what we're talking about?

Mr. Fitzgerald: I think it's understood, but it's something --

Chair Ziemer: Yes. Okay.

Mr. Fitzgerald: -- file of LBNL workers at other sites. It just seemed like something that should be mentioned.

Chair Ziemer: Right. Okay. Let's see, go ahead. Megan, follow-up and anything else on that one or

proceed?

Dr. Lobaugh: So, I guess I would just ask -- we can provide a written response in the BRS and then commit to updating the TBD with some general guidance on --

Chair Ziemer: Yes, yes. Shouldn't take but a few sentences, right?

Dr. Lobaugh: Yes.

Chair Ziemer: Okay. What else?

Dr. Lobaugh: So observation 2. So this is more information needed for internal dose assignment of short-lived radionuclides.

So in the initial response there's mention of table 2-1 the area information and parameters. There were some short-lived nuclides and nuclides with little or no gamma emissions listed. So the question is how are we going to handle those.

And our initial response would be that the White Paper, the method to assess internal dose using gross alpha, beta and gamma bioassay and air sampling at LBNL provides a method for assigning internal dose for the short-lived radionuclides. So using like we were discussing before the bioassay and air sampling results.

Chair Ziemer: Yes. That should take care of it.

Mr. Fitzgerald: We're fine with that, Paul.

Chair Ziemer: Yes. Okay. Go ahead.

Dr. Lobaugh: Okay. Observation 3 is the lack of discussion of radiological incidents. So in the initial

Site Profile there was no discussion of radiological incidents even though we knew about them from SRDB documents and things like that.

So our response would be to identify and research major radiological incidents, revise the Site Profile to incorporate those incidents and then our response regarding any kind of small incidents such as skin contamination that were brought up in the initial finding is that this information is typically handled on a case by case basis with the information that we're provided in the DOE records request.

So when we know a person was involved with say a skin contamination incident then we would account for it when we have that information. But it's not necessary to put that kind of information in a TBD or a higher level document like the TBD.

Chair Ziemer: Yes, particularly on small incidents which may involve a person or two you wouldn't put that in. You have a definition for what constitutes an incident?

(Simultaneous speaking.)

Chair Ziemer: Nobody disagrees with an SL-1 reactor meltdown as being an incident. But and there's sort of -- does each site decide what constitutes sort of an incident? You know, they have -- we have the criticality incident at Oak Ridge back in '58 I think and things like that. Everybody agrees those are incidents. But what's the threshold?

Dr. Lobaugh: Go ahead, Tim.

Dr. Taulbee: I think, Paul, what we're talking about is major ones.

Chair Ziemer: Yes, yes.

Dr. Taulbee: -- along the lines that we would include it. But what is called an incident now that would be reported into like ORPS type of system now, many of those we would certainly not include.

Chair Ziemer: No, no. I'm just wondering if there is a threshold we would have under a Site Profile -- you can't list every case where somebody has to get their shoes cleaned or something.

Dr. Taulbee: Right. I don't know that there is a very good definition of an incident.

Chair Ziemer: It's sort of intuitive I guess.

Dr. Taulbee: Yes. Major incidents we will include. The others we won't.

Chair Ziemer: Okay. Well, SC&A, that would satisfy what your question was.

Mr. Fitzgerald: Yes, I think the inclusion of major incidents would be fine.

Chair Ziemer: Okay. Let's see. I lost my thing here. Is there another one?

Dr. Lobaugh: Yes, there is a few more. So observation 4 would be the need to provide information on the met lab.

So the met lab provided dosimetry services for LBNL. Let me look at the dates. So they provided dosimetry services through 1952. So the observation here was that we didn't -- we mentioned it, but we didn't discuss what kind of services were provided, the calibration that they used, the systems that they used, anything like that.

So this is kind of an interesting one at least when I was thinking about it because the current SEC for external dosimetry goes through 1947. So there's a five-year period here where the met lab services were used that we can look into to find more information about the dosimetry services that were provided.

So we can do that, provide additional information on that.

One thing to mention though is that the internal dosimetry SEC goes through 1961. So, any workers that would be onsite through '61 for that 250 days would be covered under the SEC.

And so these would be -- the workers affected here would be the ones that are non-SEC cancers or don't meet the time --

Chair Ziemer: Right, right.

Dr. Lobaugh: So, that's just something to keep in mind for the effect I guess of this observation.

Chair Ziemer: Okay. And SC&A, you're okay with that?

Mr. Barton: Yes, that's fine. It's just a matter of going beyond just the identity of the lab to more about it.

Chair Ziemer: Sounds good. Okay. Next one.

Dr. Lobaugh: Okay. So, observation 5 is the lack of information on isotopes facilities and handling methods.

This is again just speaking to the fact that LBNL had a wide mission. There were lots of isotopes and things that they were using onsite as well as coming

up with some new elements.

So, what I would suggest is given finding 1 where we're going to be providing more information on the facilities, the handling and isotopes that were used this observation kind of falls up underneath finding 1. So I would suggest that this would actually be addressed in that finding.

Chair Ziemer: Right. It would be all inclusive there so the finding would basically be handled by the update of finding 1.

Mr. Fitzgerald: I think this one speaks to going beyond a list of the facilities and a list of the nuclides, but actually maybe some mention of what kind of work, what kind of interface by the workers there were with the accelerators and machines. Just some notion about that.

Because obviously it's a pretty diverse operation there.

Chair Ziemer: Very diverse, yes.

(Simultaneous speaking.)

Dr. Lobaugh: Yes, so for finding 1 we'll update the Site Profile with the additional facility information that we've captured since the last revision.

So like I said earlier there's been a lot of information that we've found and we're going to be able to beef that part up a lot.

Chair Ziemer: So in the record you'll simply say that you've included the information in the results of finding 1 and that will take care of that hopefully.

Dr. Lobaugh: Yes.

Chair Ziemer: Okay. Let's see. You've got another one here.

Dr. Lobaugh: Yes, observation 6 is the extremity dosimetry needs revisiting.

So this one is about the fact that the extremity monitoring is mentioned and not really discussed. So again this is one where I'm going to suggest that we think of this as addressed in another finding.

So we see that we will be responding to this in finding 7, a finding that we discussed earlier on this failure to address the shallow dose to deep dose assumption.

So in response to that we're going to be looking at the extremity dosimetry too. So we would be able to respond to this observation within that finding.

Chair Ziemer: Right. In a similar way to the previous one. Yes, that's good.

Dr. Lobaugh: Okay.

Chair Ziemer: Yes.

Dr. Lobaugh: For observation 7 there is a lack of sufficient information for external dose evaluation.

So here there were basically two major sections, or two major I guess ideas that SC&A brought forward was that we're lacking some information on dosimetry program specifics and the site description.

So, as with the previous two findings we kind of see that this would be covered under a few of the other findings that we had. So the site description part of it will be covered under finding 1 earlier and the program specifics we'll be discussing in our responses

to findings 6, 7 and 8 about the external dosimetry program.

Mr. Fitzgerald: I would add though I think --

Dr. Lobaugh: Okay.

Mr. Fitzgerald: -- comments going to be reflected in the TBD because I think this is more of a finding that the treatment of the subject external dosimetry wasn't as robust as it could be in terms of the history, the milestones in terms of one dosimeter replacing another.

I would consider those sort of the basics that you typically find in the Site Profile. And I think some of the earlier Site Profiles were more abbreviated than later ones and I think this is the case here. It could be made more robust.

So this is really a reflection of what the TBD would end up containing as far as the scope of coverage and how robust the treatment is.

Dr. Lobaugh: Okay. So our path forward would be improving the details of the external dosimetry program and the dosimeters, the historical dosimeter usage in the Site Profile.

Chair Ziemer: And Joe, are you asking for more specific time frames for, for example, when they started using CR-39?

Mr. Fitzgerald: I think when we look across the Site Profiles and particularly the second or third generation Site Profiles it's more explicit about some of the dosimeter history so that the dose reconstructor knows that certain time periods you have certain dosimetry that was replaced. A new

dosimeter came in.

Sometimes there's issues with that new dosimeter as we have seen in places like Brookhaven. So that's useful for the dose reconstructor to know that yes, there was some issues with technology.

Just really to paint the picture more fully as to what that history was and what the different technologies were. Just sort of --

(Simultaneous speaking.)

Mr. Fitzgerald: -- extremity as well, the extremity dosimeter. Just so that the dose reconstructor has a pretty good backdrop of how the site handled things.

Chair Ziemer: Yes. You're talking about even detail such as the kind of filters used in a particular dosimeter?

Mr. Fitzgerald: Again, this goes back --

Chair Ziemer: It goes into -- (Simultaneous speaking.)

Mr. Fitzgerald: I wasn't the reviewer 12 years ago on this Site Profile. I'm guessing that more granularity would help, but I would leave it to NIOSH to judge consistent with how other Site Profiles have been developed what level of detail makes sense.

I think some of these probably are too detailed and others are more pertinent to what the dose reconstructor would need.

I think that's the key, what does the dose --

Chair Ziemer: Yes.

Mr. Fitzgerald: -- reconstructor need to have as a backdrop to help them make judgments on dose reconstruction.

Chair Ziemer: Right. So we'll have a chance to judge that when they prepare that response. I don't know, Megan, if you're prepared to say now exactly what it will contain, but you hear the comment at least and you're going to try to address it.

Dr. Lobaugh: Yes. Correct.

Chair Ziemer: And this is really an observation rather than a finding so it I think to most people doesn't have quite the thrust for detail as it might have for a finding anyway. But at least more granularity as you say.

Okay. Let's see, where are we here.

Dr. Lobaugh: There's one more observation.

Chair Ziemer: Yes, one more.

Dr. Lobaugh: So, observation 8 is the overuse of generalizations and assumptions.

So this had to do with some of the ratios that we were using, so the shallow to deep dose ratio, the IREP photon energy fractions that we used and neutron to photon dose ratios.

So regarding the site-wide and time encompassing correction factors or energy group breakdowns, energy range breakdowns these are going to be covered in our responses to findings 6, 7 and 8 for the external --

Chair Ziemer: Right, right.

Dr. Lobaugh: Regarding like missed dosimetry, so there's a discussion of missed dosimetry. So, as in the dosimetry results were not included in the claim files.

As we discussed with observation 2 and 3 for the White Paper there's been some changes since the time of this SC&A review to the actual records request responses from DOE. So now we're receiving all of the medical files as well.

And I just wanted to say a reminder that there is always an SRDB document review that automatically happens in the background that ties any documents found in the SRDB with the employee name or other identifiers to that claim.

So -- and the dose reconstructor takes all documents into consideration when they're doing the dose reconstruction. So that's kind of in response to the missed dosimetry.

And then how their claims process has changed. So I would suggest that this would be addressed in findings 6, 7 and 8 and then observations 2 and 3 from the White Paper.

Chair Ziemer: And in your overall response will there be I guess documentation for this and some of these other observations you'll refer back to the fact that they're covered in the findings, in those particular findings. Is that how it will happen?

Dr. Lobaugh: Yes.

Chair Ziemer: Okay. Sound okay to you, Joe?

Mr. Fitzgerald: That's fine.

Chair Ziemer: Yes. And Brad, we're okay? On all these observations.

Member Clawson: Yes. We're fine, Paul.

Chair Ziemer: Okay. Now, let me ask Ted are there any other things that we need to cover today? I think we've covered everything.

Mr. Katz: I think we're good. I think we just -- it would be helpful to have something -- and I know there's like better understanding now about some of the SC&A concerns and follow-up that will be needed to address these, particularly the primary findings of concern.

But so earlier in the meeting, Megan, you had mentioned that some material would be ready sometime this summer. But I don't know whether all the rest of the discussion that comes in sort of gives you a different calibration of roughly where in the calendar we're talking about possibly meeting again?

Not that I'm going to schedule it now, just it's helpful though to have a sense of where we're headed.

Dr. Lobaugh: I think we'll be able to provide some preliminary responses this summer. As far as follow-up to the White Paper I think that's going to take us a little while longer because like you said we're going to update that White Paper. So I think that's going to take a bit of time.

And I would say that's probably from how we see it our priority is the follow-up to that White Paper and the air sampling questions.

But as far as preliminary responses to some of these TBD findings that we haven't responded to, especially

the external dosimetry, we expect to provide that fairly soon. I would say this summer.

Mr. Fitzgerald: Megan, I had one quick question.

Dr. Lobaugh: Yes.

Mr. Fitzgerald: You pointed out in one of your updates that Lawrence Berkeley declined to I guess send pre-2010 medical information. You pointed out that more complete medical files are being provided. But that's only post 2010, right?

Dr. Lobaugh: So what happened there was when we discovered this in 2010, Lawrence Berkeley I would say had a lot of pushback on the amount of time that would take them to provide the responses.

So as I explained before we actually just started this re-request in January. And it is just claims prior to 2010 because since 2010 they've been sending us the entire medical file because they're sending us the DAR information.

So, the re-request that we're currently in the process of doing or receiving responses for starting in January and it's any claim that was received prior to 2010 that was not compensated under an SEC or the dose reconstruction process already. Yes.

Chair Ziemer: Do they have the full list of that now? They have the full list though, right?

Dr. Lobaugh: Yes. They've received the full list of claims that we've requested and we've prioritized it for them in groups of about 25 or so which we received the first 25 so the prioritized group of 25, our first 25 we received.

And then they've already come back with responses on an additional 52 that did not have any medical files. So we consider those 77 or so claims completed of that response.

Chair Ziemer: But that will continue for a while until you get all of the ones available.

Dr. Lobaugh: Exactly. So currently LBNL is determining the best -- so they've contracted out some work to do the copying and some of those tasks.

And so the next discussion that we're having with them is going to be the best way to receive the final responses so that it's not such a burden on them because they really do I think only have like one person working all of these requests.

So they're working the regular routine requests that are coming in as well as these extra ones we've asked them to do.

Chair Ziemer: Ted, I'm wondering if maybe sometime around July we might want to -- if we have some completed documents or White Papers or whatever it's going to be that we could have a teleconference just to deal with them so that they can move forward. We'll just have to see where we are though.

Mr. Katz: Something similar, Paul, that just the staff on both sides, SC&A and DCAS. When you feel like it would be useful to have a Work Group meeting so you can push forward with some of the matters that do get responded to. Let the Work Group know and we'll schedule accordingly. So we'll leave it in your hands to judge when you have material that you'd like to move on one way or another and it would be helpful to have a Work Group meeting. In this

summer or after. Does that work?

Mr. Fitzgerald: That sounds good.

Mr. Katz: Okay.

Adjourn

Chair Ziemer: Okay, we'll go on that basis then. Sounds good. Okay. Well, thank you, everybody. Appreciate the -- I think we made good progress here on this today. So we will adjourn.

Mr. Katz: Thank you, Paul. Thank you, everybody, for all this work.

Chair Ziemer: Thank you.

(Whereupon, the above-entitled matter went off the record at 1:02 p.m.)