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
Los Alamos National Laboratory Work Group
Wednesday, March 23, 2022

The Work Group convened via video-teleconference at 11:00 a.m. Eastern Time, Josie Beach, Chair, presiding.

Members Present:

Josie Beach, Chair
Henry Anderson, Member
Bradley Clawson, Member
Jim Lockey, Member
Gen Roessler, Member

Also Present:

Rashaun Roberts, Designated Federal Official
Nancy Adams, NIOSH Contractor
Terrie Barrie
Bob Barton, SC&A
Finn Black, SC&A
Elizabeth Brackett, ORAU Team
Grady Calhoun, DCAS
Nancy Chalmers, ORAU Team
Andrew Evaskovich, Petitioner
Joe Fitzgerald, SC&A
Rose Gogliotti, SC&A
Tom LaBone, ORAU Team
Mike Mahathy, ORAU Team
Rich Merrill, ORAU Team
Chuck Nelson, ORAU Team
Michael Rafky, HHS OGC
LaVon Rutherford, DCAS
Tim Taulbee, NIOSH

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Proceedings

(11:00 a.m.)

Welcome and Roll Call

Dr. Roberts: I'm going to go ahead and say good morning to everybody and welcome everyone to the Advisory Board on Radiation and Worker Health. This, of course, is a meeting of the LANL Work Group. I'm Rashaun Roberts. I'm the DFO for the Board. There is an agenda and there are other meeting materials for today. You can find everything on the NIOSH website, under 2022 Meetings, for March.

Since Board meetings who have conflicts with regard to this site can't be in the Work Group, I will say for all of the Work Group Members that they don't have a conflict of interest. As I go through roll call, other staff, please do state any relevant conflicts that you may have as I move through the roll call. So let's go ahead and start with the Chair, Josie.

(Roll call.)

Dr. Roberts: Thank you, and welcome to all of you again. Just a couple of items before I give the floor to Josie, who's the Chair of this Work Group. So, in order to keep things running smoothly, and so that everyone speaking can be understood, everyone please make sure that your mute button on Zoom, if you're on Zoom is muted, and also if you're on the phone, you need to make sure that you're muted as well when you're not speaking.

So the mute button for Zoom is in the lower left-hand side of your screen. And if you're attending via telephone, you will need to press *6 to mute. And if you don't have a mute button, if you need to take yourself off mute, press *6 again. Again, all of the materials for today can be found on the NIOSH/DCAS website, and all materials were sent to Board Members and to the staff prior to the meeting.

So, with that, I will go ahead and turn the meeting

over to you, Josie.

Member Anderson: Rashaun?

Dr. Roberts: Yes.

Member Anderson: I just wanted to -- I'm Henry Anderson, and I'm the Chair of the Board, one of the current Board Members that are on these committees. I'm trying to sit in on some of the Committee meetings periodically just to get up to speed on what everybody is doing, as the new Chair now. So I'll be on and off. I'm just listening in. Thanks.

Dr. Roberts: Great. And just for everyone's information, any Board Member, including, obviously, the Board Chair, is welcome to sit in on any of the Work Group meetings. So thank you, Andy, for that.

And so, Josie, now I can turn it over to you.

NIOSH Presentation: ORAUT-RPRT-0102,
Assessment of Los Alamos National Laboratory
Plutonium Bioassay Programs 1996 to 2001

Chair Beach: Okay. Well, thank you so much. And Henry, nice to have you on today. You all remember our last Work Group meeting was in July of 2019. I'm going to make a few comments before I turn it over to NIOSH. First of all, I would like to say I'm confused about what is in RPRT-0102. It's not the analysis that the -- that was promised back in 2019 by NIOSH.

That was to be a review of the completeness of job-specific bioassays based on available RWPs, not whether a coworker model can be based on routine, mandatory plutonium bioassays.

Back in 2019, LaVon told us that all the RWPs had been identified, and the LANL RWP database was fully available to NIOSH. You can see that in the transcripts on page 13 of that last meeting, and that we would see a proposed RWP sampling plan before a review was conducted.

Now if you look back, there's been five updates to the Work Group and the Board, and there's been no mention to the Work Group that NIOSH decided a sampling plan would not be necessary. This is a sampling plan, as you remember, was agreed upon during that last meeting.

From reading the introduction to RPRT-0102, it looks like NIOSH decided that the Work Group's questions about potential gaps in the RWP bioassays was not relevant enough, and decided to answer a different question, one that we did not ask.

So five years after first raising the issue of NCID-484 and the question of incomplete job-specific bioassays, I feel like we are no further along, and it's -- that's a question. I don't know how any other Board Members feel about the review of 0102.

Member Clawson: I do. I think it's an absolute joke, and this really upsets me that we have put all this time into this. These Petitioners have been waiting five years and you return garbage like this to us? You talk about conflict of interest. Here we are questioning the report that Liz Brackett and Tom LaBone went into LANL and performed, and they have no conflict? I beg to differ, who's even wrote 0102.

This, to me this is totally against everything. We've been waiting five years for this. There has been no communication about this. There's been nothing about changes or anything else.

The other thing is, is to me this is a deliberate delay of time. We have talked about this so many times. This isn't a science project. We asked for this data completeness. I'm having deja vu right now, because I'm going through the same thing I did in Savannah River, and guess what? A lot of the players in this are the same people.

Myself personally, I don't think that we should even look at 0102. This is not what we wanted, this is not

what we asked for, and I think that we ought to be pushing towards an SEC for this, because if NIOSH is non-responsive to be able to give us what we need, then there's no other choice.

We go with the SEC. I think that this is deliberate to be able to keep it out of the hands of the Petitioners, because when they keep this into the Board and in the Work Groups, the Petitioners have no grounds to question anything or do anything. This to me was literally a slap in the face to the Board and the Petitioners.

Dr. Roberts: Okay. With that, let me just check in. Let's see if Gen or Jim, did you have anything that you wanted to add, if you've had an opportunity to review the report or to weigh in.

Member Roessler: I'll comment. What Josie and Brad are saying is a real surprise to me. I wasn't thinking of it from that point of view and I kind of don't know how to respond to it, especially Brad's comments.

I really don't know how to respond. I did look at as a science approach. I thought that in view of I guess the previous reviews, that NIOSH decided to take a different approach and that's what they're presenting today.

So to preview it with these comments I'm, I'm just kind of confused. I guess I would like to hear from NIOSH, to see if -- and then I know that's going to take a long time, but to see if your concern is justified. I'm just trying to, not knowing how this should be handled.

Chair Beach: Let me expand just a bit, and then Jim, we'll let you talk. Gen, we as a Work Group gave NIOSH an assignment basically to create a sampling plan and to bring that sampling plan back to the Work Group, and the Work Group would decide the path forward. NIOSH decided to throw out the sampling plan with no review by the Work Group, and changed the question that we asked them initially.

Mr. Rutherford: I would like to say something on this real quickly.

Chair Beach: Okay.

Mr. Rutherford: Because I will -- I am almost positive that I sent you an email that indicated that we decided not to do a sampling plan because we recovered all the RWPs that we could and there was no need to do a sampling plan because we were going to do all of the -- we were going to use all of the RWPs that met the design criteria.

I will go back and look and see if I sent that or if I didn't send that. But I'm almost positive that I sent it.

Chair Beach: I spent quite a while reviewing all the, all the emails that went back and forth between us.

Mr. Rutherford: There is no need for a sampling plan if we use all of the RWPs. That was the point.

Member Clawson: Job-specific, job-specific RWPs. You're telling us you have all of those.

Mr. Rutherford: We recovered all of the available RWPs from LANL covering the study period, yes. All that they had, all that was available. I'm not saying, and I see you smiling Brad, but I'm not guaranteeing you there that there was every RWP. But we captured every available RWP that they had or was available to get.

Chair Beach: Well that was the purpose of the sampling plan, LaVon. We don't know if there's 40, 60 percent of those RWPs that are missing in the --

Mr. Rutherford: Josie, which is going to be better? If they meet the design criteria, if they meet the design criteria and I take every one of them that meets the design criteria, that's going to be better than a sample.

Chair Beach: LaVon --

Mr. Rutherford: The reason why -- the reason why you do a sample is because of the fact that there's such a large volume in number, it's going to take too long to even go through it.

Chair Beach: LaVon, there was absolutely no notification of this to the Work Group. The Work Group should have had a say in the change of plan.

Mr. Rutherford: I agree. If I didn't send that, I agree with you, that the Work Group should have been made aware of that. But I thought for sure I sent you that email. I will go back and look at that, and if I didn't, I didn't. But again, taken all of them into account is going to be better than taking a sample.

Dr. Roberts: Excuse me. Could we have Jim weigh in?

Chair Beach: Yes.

Member Lockey: Hi. Just to give you a heads up, I'm actually in Tampa, Florida. I'm in the Trauma Unit down here with one of my family members, so I'm going to have to -- I may have to go in and out of this meeting just because of what's going on outside.

But anyway, when I read the document 0102 today, that was -- it was an interesting read, because I wasn't -- that's not what I was expecting. But when I went through it and I went through it in detail last week, it actually it's a very good thought out, made-out well sampling plan that, at least from a scientific perspective, from my perspective, if all the criterion sampling plan were worked out --

Dr. Roberts: Nancy, could you please mute your Zoom?

Member Lockey: If the sampling plan holds up, which I think it probably will, it's an excellent way to do a co-exposure model for dose reconstruction. The data is very rigorous, it's -- the plan is well laid-out and I guess from a scientific perspective it's a very scientific, valid approach. So I'd be interested to see

what NIOSH -- I would be interested in seeing the presentation.

They're good scientists, they know what they're doing, they know how to put a sampling plan together and they know to do a co-exposure model. The question is, is the data adequate to support the plan they're approaching. For me, I found it from a scientific perspective an excellent, excellent approach.

Chair Beach: And realize we don't have a sampling plan. NIOSH didn't complete the sampling plan. They've thrown it out and came up with a study --

Member Lockey: If they can -- if they can do the dose reconstruction in a very valid manner, Josie, and it reflects the exposures that people had been potentially experiencing, then they can do good dose reconstruction from these.

Member Clawson: Well, do you believe, Jim, that they'll be able to perform data adequacy?

Member Lockey: Yes. Based on what they presented, I think they can. From a scientific perspective, Brad, yes.

Member Clawson: Well, yeah. That's --

Member Lockey: I would -- if I had a database like this I -- you know, again, I'm looking at it, the way I look at things, from a science perspective, it's an excellent database, and at least their approach is. Now, it has to be looked at and make sure that all the things that they have stipulated in fact are present.

I have no reason to think they're not, but that would take a review, perhaps by SC&A, to validate it. But if you're interested in doing a valid dose reconstruction, Brad, and you're looking for outliers, you'd take the highest exposure group, which is the plutonium group. You'd look at the various ways they have validated this to make sure they're capturing the data that reflects the population. It's a good approach.

Member Clawson: And that says nothing for --

Member Lockey: It says everything for dose reconstruction.

Member Clawson: -- of specific bioassays. It says nothing about that. This is taking totally routine plutonium samples. These are ones -- the people that are on them, they get routine all the time. This says nothing and that people were able to go to this. This is the exact same thing that we were into with Savannah River, and we got -- we got the bootstrap, we got this, we got that.

But all in all it come down to is you cannot do it. And there's a science project -- there's no doubt. I have no question. These are outstanding health physicists and everything else like that. But this isn't a science project. This is a compensation program and the requirements for that are far different in my eyes.

Mr. Rutherford: I do want to say that this does include job-specific RWPs. If you look at the report, the report -- we pulled RWPs. RWPs are covered in that. That's in my presentation.

Chair Beach: What percentage of RWPs? I think it said, what did you say 70?

Mr. Rutherford: No, here's much more RWPs than that. You need to --

Chair Beach: Job-specific?

Mr. Rutherford: All of the RWPs are job-specific RWPs.

Member Roessler: Aren't we -- aren't we jumping again here by evaluating the report before they're even presenting it? It seems that we have no reason to say that they can't present their work. Then we evaluate it as a Work Group. If we decide that we should continue, then we turn it over to the other scientific branch area, SC&A, to take a look at it.

Chair Beach: Gen, you're correct in a way, but the Work Group requested a job sampling plan. NIOSH agreed to present that to the Board. They decided without consulting the Work Group that they were going to throw that out and come up with the coworker model instead, and they changed the question that we initially asked.

If you look at the introduction of RPRT-0102, the question, they completely changed it from job completeness to something that suited their needs, not what we asked and that is what the real problem is.

The second part of the problem is this is going to delay a decision for years, and we asked for a job sampling plan. I would still like to see that job sampling plan. If NIOSH isn't going to do it, then I suggest that we turn that over, all the data to SC&A and request they do a job sampling plan, that we requested it three years ago.

Member Clawson: So, LaVon, let me ask this question. Is this just plutonium? Is that the only ones that you're looking at --

Mr. Rutherford: We did under this -- under this report, we looked at just plutonium. If you look at 0101, it covers all of the other exotic radionuclides. Now we do have other RWPs that we, you know, have the ability to look at. But yes, this report addresses just the plutonium RWPs.

Member Roessler: Well I understand, Josie, your frustration with this. But it just doesn't seem like we're going the proper way to just dismiss this. I think that we should hear the report.

We can't prove right now whether LaVon had actually alerted us to this, but he is now today alerting us to the change, and I think we ought to at least hear the report and judge whether this is an acceptable way to go.

And if we do, then we assign it to SC&A, and that's kind of a normal procedure. I don't think it's going to take all that long to do that.

Member Clawson: Well, that's -- and I understand what you're saying, Gen. I think when this one started out it would be six months; five years later.

Dr. Roberts: But Gen, I think, does have an appropriate point. This meeting was called today to give NIOSH an opportunity to present the two reports. We could certainly return to the discussion after those presentations.

Also, another thing that was, as we were planning the agenda for this, was that SC&A was going to be tasked as part of this meeting. So my recommendation would be to go ahead and move through the agenda.

Chair Beach: That's fine, and we'll come back to either the tasking. I'm not letting go of the sampling plan at this point. I'd like to come back to that as well. My biggest frustration is when we set up this meeting, we were going to look at the sampling plan, so this is completely different than what we had originally agreed to.

Member Clawson: Well, we weren't just dealing with one radionuclide; we were dealing with a lot more. There's 40 percent of the RWPs bioassays that are missing, but you know we can -- we can throw numbers at it.

Chair Beach: I guess it's been recommended we go ahead and go through the reports, and I have no problem with 0101 by the way. I know we're starting with 0102, so LaVon, I guess you can tee that up.

Mr. Rutherford: All right. I'm going to take my video off, because I'm going to switch to my big screen.

Chair Beach: Okay.

(Pause.)

Mr. Rutherford: Let me know if you're seeing my screen.

Chair Beach: Yes, sure. We are, we are.

Mr. Rutherford: All right. I'm going to go ahead and get started, as soon as I find my glasses. So I'm LaVon Rutherford, the Health Science Administrator for DCAS. We're going to go over two reports today. The first report is titled "Assessment of Los Alamos National Laboratory Plutonium Bioassay Program from 1996 Through 2001."

This report is on our website. Both the reports and their presentations are available. I do want to acknowledge a few people from ORAUT that worked on this report: Mike Mahathy, Rich Merrill, Elizabeth Brackett, Tom LaBone, Nancy Chalmers, and even though he retired Chris Miles. He put a lot of time on this petition over the years.

So I'm going to talk about the background, report overview, study design, data analysis and summary and conclusions. I'm looking to do a little bit more on the background. Both reports I'm going to talk about today are in support of the evaluation and review of SEC Petition 109. The petition was received in April of 2008. The petition qualified for evaluation in May of 2008.

The qualified period for evaluation was 1976 through 2005, and NIOSH issued an evaluation report in August of 2012 recommending a class be added to the SEC for the period 1976 through 1995. We issued an addendum in April of 2017 covering the remaining years of 1996 through 2005.

In the addendum, we indicated dose reconstruction was feasible for '96 through 2005, given the LANL Radiological Control Program indicated a robust monitoring program and a documented radiation protection program implementing 10 C.F.R. 835.

In addition, NIOSH review of the non-conformance

tracking system and current supporting system did not identify any major concerns. However, when SC&A reviewed the addendum, they also reviewed NPTS non-conformance tracking system and the current supporting system, and pointed out NCID-484.

NCID-484 identified a number of findings that raised questions and concerns about the LANL bioassay program. NCID-484 came about because of a 1985 LANL assessment. During that time, DOE had issued a moratorium on sites to allow sites to self-identify issues with internal monitoring programs, identify corrective actions without being fined under Price-Anderson.

ORAUT got some outside help from people that had seen the issues at other sites. They conducted the assessment. So the 1999 audit of the Los Alamos National Laboratory bioassay program listed several deficiencies in the bioassay program that were of regulatory concern. Of particular concern to this report was Finding 1. Radiation workers were not consistently placed on the appropriate routine bioassay program.

The issue discussed in this finding included an ineffective HP checklist, workers failing to submit bioassay samples per RWP requirements and Johnson Controls Northern New Mexico, which I'll start calling Johnson Controls, personnel not fully participating in required bioassay programs.

The finding prompted the Work Group to ask NIOSH, due to 1999 LANL findings regarding bioassay program deficiencies, implied data inadequacy and incompleteness significant enough to impair dose reconstruction. So at the November 25th, 2018 Work Group meeting, NIOSH committed to reviewing RWPs and developing a sampling plan for determining whether -- did I get that, sorry -- determining whether workers were complying with bioassay requirements and what effect that may have on dose reconstruction.

After capturing RWPs, we decided a sampling plan would not be necessary. We would include all the RWPs that met the study criteria, design criteria for the analysis. So if you take all of the -- if you took an entire set of data and you used the entire set of data, that is going to be better than taking a sample of the data, or it will -- the sample could be as good, but the entire data set is the best, would be the best overall.

I would ask our statistician, Nancy Chalmers from ORAU, am I correct here?

Ms. Chalmers: Yeah Bomber, you are correct. I was actually the one that pushed to, you know, have us analyze all the RWPs instead of just the sample, because even if it's a random sample it could not be representative of the entire population. If you have the entire population available to you, you should always look at that.

I think the sample, we were kind of settling for like you mentioned before, just for like efficiency sake. And so the fact that we could get them all, enter them, you know, in a fairly short amount of time and analyze all of them, I would always prefer to have everything, not a sample.

Member Clawson: Nancy, this is Brad. I totally agree with you. That would be good. So you're telling me that you covered all nuclides and everything, every RWP you've got. So what percentage of RWPs do you think that you've got total?

Ms. Chalmers: I think Bomber has a slide later where he defines what we called a Notable RWP, and we did -- our data capture folks, which you know they're very good folks, they made the best attempt they could to capture all those Notable RWPs they could get their hands on. And so if there are questions about how they did that and all of those things, I think we can direct that to the data capture folks.

But we had them come up with a definition for

Notable RWP, and they handled sort of that part of the process. We got the data -- we got the data and we analyzed it all, everything we got our hands on.

Member Clawson: Answer me, answer me this then. As a statistician, if you take one radionuclide and you just look at that one radionuclide, with numbers can't you skew that? Can't you make it look better than what it really is overall?

Ms. Chalmers: Brad, our intent was only to make a statement about plutonium in RPRT-0102.

Mr. Rutherford: And then we looked at the other radio, the exotic radionuclides in Report 0101. Why don't you let me finish the report, and then you can -- or this overview, and then we can answer questions after that?

Member Clawson: That sounds fine. Don't bring anybody else in either, okay LaVon?

Mr. Rutherford: Well, the reason why that was a specific question that was brought up, and I thought that Nancy could provide a little more detail and help us out. So I'm going to continue on report overview.

So since co-exposure models are used to perform dose reconstructions for individuals without monitoring data, the question by the Work Group changes to do the indicated bioassay program deficiencies apply data inadequacy and incompleteness significant enough to impair development of a co-exposure model.

So if individuals are not leaving their bioassay data, if we have indication of that and, you know, what we would use to fill in the gaps for individuals, for unmonitored individuals. We would use a co-exposure model. So we felt switching this question to a co-exposure model question made sense.

RPRT-0102 was developed to answer the question for plutonium. Why plutonium? I realize a conclusion was made that the primary radionuclides could not be

used to address the exotics. Well, Report 0101 addresses the exotics, and I'm going to go through that a little bit later.

Plutonium was used because plutonium posed the greatest radiological hazard to workers at LANL during the study period. If so if LANL was correctly monitoring for plutonium, what evidence would make us think that the monitoring was different for other radionuclides of concern? Also, what makes us think that a worker would leave the required bioassay sample for plutonium, but not for other radionuclides?

So we've got all these workers and we've got -- we determined they come up, that they're leaving bioassay samples for plutonium. But what makes us think they're not doing it for other radionuclides? That's something to think about.

Co-exposure models. I'm going to talk about -- I'm going to shift to Slide 9, and I want to talk about Slides 7 and 8. Okay. The goal of the co-exposure study is to estimate the probability distribution of external doses or internal intakes to a target population. So our target population, if you look at either of those diagrams on either side, our target population is the exposed workers.

All members of the target population who are monitored are referred to as the study population. So you've got exposed workers and then you've got exposed workers that are monitored, and that's the study population. The distribution of intakes in the study population is referred to as a co-exposure model, and it can be used to estimate the distribution of intakes in the target population.

So we take the monitored individuals out of the study population, we create a co-exposure model, and then that co-exposure model is used to estimate intakes to exposed workers or potentially exposed workers who were unmonitored. So since co-exposure models -- wait a minute. So in the event the entire study

population is not available, the co-exposure model is constructed from a study sample.

So if you look on the left-hand diagram that we have taken the study population, and we take a study sample, and that study sample is then used as the co-exposure model, for the co-exposure model and then used on the unmonitored workers.

Three conclusions can be made. All the workers in the target population do not have to be monitored to construct a co-exposure model. If all the people in the target population were monitored, a co-exposure model wouldn't be necessary. So if the co-exposure model is generated from the study population, a bounding model can be generated if a significant portion of the most highly exposed workers in part of the population are monitored.

If the co-exposure model is generated from a study sample, a bounding model can be generated if the previous conditions hold and the study sample is not missing a significant portion of the most highly exposed workers from the study population. So I thought going through 7 and 8 while looking at the actual diagram would make that easier.

I want to talk about regulatory compliance. The 1999 audit was intended to assess whether LANL was in compliance with the regulations promulgated in 10 C.F.R. 835. These regulations established criteria for limiting dosed workers and for acceptable design and implementation of internal dosimetry programs that were used to demonstrate compliance with these dose limits.

Because compliance with regulations help to minimize and limit dose receipt by individuals, even one instance of non-compliance is of interest to the regulator and the site.

Dose reconstruction is concerned with making a reasonable estimate of the radiation doses received by an individual. To obtain a reasonable estimate of

radiation exposure based on a co-exposure model, it need only be based on a representative sample of the workers performing radiological work. Compliance with the regulations in place at the time the radiological work was performed is not required in order to perform a dose reconstruction or develop a co-exposure model.

All right. I want to talk about the study design. The approach used in this study was to assemble and analyze all the relevant data, available data about the plutonium monitoring program at LANL during the 1996 through 2001 study period.

We want to look at the Health Physics Checklist; the Bioassay Enrollment, Scheduling and Tracking, the BEST system; plutonium in vitro bioassay; plutonium in vivo bioassay; external dose; and then RWPs that require plutonium bioassay.

The Health Physics Checklist is a paper form from a worker, the manager and a representative from Environmental Safety and Health filled out to make changes in the worker's in vitro, in vivo and external dose monitoring programs. ORAUT captured Health Physics Checklists covering years 1985 to 2002. They developed a database from the study period of 1996 through 2001.

The study looked at the HPC adds, which means an individual was added to the plutonium bioassay program. Okay, if you look at this, these are adds, individuals that were added to the plutonium bioassay program over the years. You can see the drop-off in 2001. We believe this is because they were switching to the electronic dosimetry evaluation system and doing away with the Health Physics Checklist.

Now I want to talk about the BEST system. BEST is a system that was used to manage bioassay program enrollments, which included adding and removing workers from routine baseline termination and special monitoring programs. BEST data set --

enrollments that placed workers on bioassay programs were referred to as adds, which always had an associated sample request that is referred to as an enroll request.

So if the add-in added it was an enroll request. Sample requests not associated with adds for routine work samples were referred to as non-enroll requests. Some of the enroll requests and the non-enroll requests is the total of the number of plutonium bioassay requests in a year. So if we look at the enroll requests of five of them, you can see in green, and the non-enroll requests in blue. If you add those two together that's the total number of samples they would have in a given year.

I also wanted to note that even though a non-enroll request, if you look at this previous slide said was referred to as for routine samples, routine samples could also be given to workers under an RWP if that person is on a routine sampling program.

Okay. Let's talk about the in vitro bioassay. The in vitro bioassay data set was already created in support of OTIB-63. The data set includes 12,666 plutonium urine and fecal bioassay samples of 3,219 workers during the study period. The 12,619 urine bioassay results are the data that will be used for a co-exposure model for the plutonium at LANL, for plutonium at LANL.

So we look at the in vitro bioassay data set. We've got workers on the right, samples on the left. You can see the large number of workers and samples over the period of 1996 through 2001.

Now let's talk about the in vivo bioassay data set. The in vivo bioassay data set was already created in support of OTIB-63. The data set includes 6,817 plutonium/americium chest counts from 3,282 workers during the study period. The number of workers monitored by chest counting and in vitro bioassay is essentially constant over the study period.

Approximately 80 percent of the workers monitored for plutonium by in vitro bioassay were also monitored by chest count. So you can look at that. You've got workers and the number of counts completed, relatively constant through the years.

External dosimetry set. Give me a second. The external dose records of LANL workers provide a comprehensive list of individuals who performed radiological work. If you think about any individual that's going to go into a controlled area, whether they have their potential to see or potential to be exposed internally, they're going to be -- they're going to be monitored externally just because it's easy to do it. So you have a lot more people that are monitored externally.

So we wanted to pull that data set the way we could use it to fill any data gaps that we had on some of these other different data sets. So again, the external dosimetry records were used to help identify individuals are missing employee numbers and other data sets and as an aid in the entry of those data sets.

The external dose data consists of the 3.4 million records in the access data set. There are approximately 11,000 workers at LANL who were monitored for external dose each year during the study period.

I want to talk about the RWPs. RWPs were used to control work with a high potential for exposure to radiation. All other radiological work was performed according to safe operating procedures. RWPs with plutonium access list check required that a person be on a plutonium monitoring program before performing work under the RWP.

Also, RWPs were specifically called out in the assessment, in that two out of five workers on one RWP did not leave the required bioassay samples. RWPs and acknowledgment sheets were transcribed by the ORAU team from the documents that were

captured during the nine targeted visits.

Notable RWPs were targeted for capture where a Notable RWP is defined as an RWP that occurred within the study period, required urinalysis as noted on the RWP by having special urinalysis or plutonium access list checked, or contained other equivalent terminology or notation indicating urinalysis.

(Phone ringing.)

Dr. Roberts: Mute.

Mr. Rutherford: Also contained in associated roster with names of personnel acknowledging the RWP.

Plutonium access lists and acknowledgment sheets. The plutonium access lists were generated monthly and mailed as a memorandum to designated field contacts. Workers signed an acknowledgment sheet during the pre-work briefing, which was required before working under the RWP. The signature on the acknowledgment sheet indicated that the worker understood the monitoring requirements of the RWP.

Note that a worker could have signed an acknowledgment sheet and never performed work under that RWP. It is not a sign-in sheet. So if you look at a lot of the -- or at least some of the sites, some of the sites we used a sign-in and sign-out sheet going into an area, because they may have time limits on time that you could be in a given area.

For these RWPs, these are signed. They signed the acknowledgment sheet that they've read the RWP and they understand it. It didn't mean that they actually worked under that. They could have a group of workers that they took and said okay, I want you to -- you could possibly do work under this RWP, so I want you to read and sign it, the acknowledgment sheet so if we need you to do work under it, you can.

Okay. The RWP data set. During the study period, there are 19,568 records in the RWP data set, where each record is a signature of one worker on the

acknowledgment sheet of a particular RWP that had a PAL requirement. There are signatures from 1,942 workers.

So we're not saying there's 19,568 RWPs; but what we're saying is there were 19,568 signatures from a worker on an acknowledgment sheet. A reasonable number of RWPs were obtained for the primary plutonium facilities at LANL.

Now I want to talk about the data analysis. So we put a little diagram together. You can have an HPC, Health Physics Checklist. That Health Physics Checklist can feed the BEST, and then BEST will identify if you're on a plutonium access list and then you have RWPs that will go into the acknowledgment sheet or sign, the acknowledgment sheet is signed and then -- then that feeds into the in vitro and external and in vivo database because they could identify requirements to be in any one or all of those.

So from the data set, we know that there are issues with the Health Physics Checklist. That was one of these things that was identified in the assessment. There's another problem-based PC checklist not being submitted consistently. So if we took solely the analysis of the HPCs to BEST to in vitro, the branch cannot --

We wouldn't get anything of any real value other than that we know that of the HPC checklists that are submitted, these are the numbers that actually got into BEST and these are the in vitro, because you know if they weren't ever submitted, they wouldn't have got there.

So to address this issue, we analyzed the RWP, the acknowledgment sheet and then the in vitro/in vivo branch. This will show if a worker who did work with a potential for exposure to plutonium was monitored for plutonium. Note that this analysis is independent of whether a worker submitted an HPC or not.

In fact, you can look back at this. If you look at --

from an RWP to acknowledgment sheet, then if they got into the in vitro or external in vivo databases, whether it was required. Those are independent of the HPC.

So if an individual performed radiological work that required monitoring for plutonium and was probably monitored, the HPC paperwork is irrelevant. So from the data set, we should be able to answer three critical questions. Were workers who signed an RWP acknowledgment sheet with a PAL requirement monitored in a timely fashion? What fraction of workers who signed the acknowledgment sheet were given RWP and was monitored? And what were the relative exposures of the different groups to plutonium?

All right. The comparison of BEST versus the in vitro database. Overall out of 13,895 requests made through BEST for samples to be analyzed for plutonium, 11,914 were fulfilled or 85.7 percent. All requests from BEST were tracked and most were accounted for with reasons being given why sample requests were not fulfilled.

Of the 1,981 samples not received, 1,613 have legitimate reasons for not being received, such as termination or extended leave of the individual. A large number of the missed samples, the reason code was inactivation for migration. These were sample requests that were cancelled to move BEST to a new database.

So if we look at the plutonium samples requested through BEST and received for all workers. So we got requested and received, which is basically a percentage for each year. You could derive a percentage for each year from '96 through 2001, and our overall compliance is 85.7 percent.

If you look at this through, it's relatively constant. The assessment occurred in 1999, and if you look at it there's really no major jump in 2000. After that assessment, the number of samples requested and

received and the percentage is not largely different. In fact, it's a little less. So we looked at -- we identified nine companies with at least 100 requests in BEST. Johnson Controls, KSL and LANL had the highest number of requests.

So we looked at those and remember, Johnson Controls was specifically called out in the assessment. So this graph looks at Johnson Control, the requests into BEST and the numbers that were received. You can see that they were lower, under lower than the other groups, and on average of 71.6 percent.

But you can also see the observed decrease in the number of requests made to and samples received from the workers in '99 through 2001. That can be attributed to a planned reduction in the number of workers being on the monitoring program, which was actually discussed with LANL.

These -- one of the issues that the Johnson Controls RadCon manager had concerns that they were monitoring individuals that did not need to be monitored, that so many of them were always getting, you know, no dose, that they didn't feel that they should have been monitored. So with discussions with LANL, they reduced the monitoring requirements on them.

So I want to talk about a comparison to the HPCs versus BEST. So we know that the HPCs we have a problem, that sometimes they weren't being submitted. But we did want to look at these and to see if they were submitted, what's the percentage of them getting there and you can go from there.

So there are 1,856 adds from the HPC checklist during the study period. A detailed comparison of the HPC with BEST showed that 1,802 out of the 1,856 adds were of plutonium or were matched BEST. That's a 97.209 percent, and if you took into consideration that in vitro, the entire in vitro data sets, ones that did not actually end up with BEST, we

came up with 1,848 or 99.5 percent.

So therefore workers who submitted the HPC add forms almost certainly were entered in the BEST system. So if they got there -- they almost definitely got into the system, so that's a good thing.

So compliance with radiation work permits. A key part of this report is to quantify the extent to which the LANL workforce complied with the bioassay requirements for work involving plutonium. Workers were required to sign the RWP acknowledgment sheet for an RWP, to indicate they understood the monitoring and personal protection equipment requirements of that RWP.

As indicated earlier, their signatures did not denote that they performed any work, only that they understood the requirements to work under that RWP. So in the report, Table 10-1, sorry the statistics for monitoring of RWP work introduces a couple of terms that need to be explained.

The table is recreated on the following slides. Work and Workers columns refers to the percentage of work and workers respectively. They were probably monitored as determined using the active RWP period and post RWP window. Work and Workers columns refers to the percentage of Work and Workers. The Other Work and Worker with the O, Open Window, refers to the percentage of work and workers respectively who were properly monitored as determined used the active RWP period, post RWP window and open window.

So I'll explain this a little bit more. I'm going to pull a slide up here. So if you think of work as equivalent as a -- assume -- if you think of work as equivalent to one RWP, that is where. So for example if you had an individual that signs ten RWPs in a year and complies with the monitoring requirements for nine of them, then 90 percent of the work was in compliance. That's how these numbers are generated.

The Worker column, if you look at it specifically, it's specifically associated with the Worker itself. So that's where that number 65.1 percent for Johnson Controls, those are some of our key numbers that we were looking at. And again, the Work and Worker without the open window, that is solely individuals that submit a sample within the RWP period or the RWP or the, I'm trying to think of the proper term, or basically in that year of the -- or in that year shall I say. Let's get that right.

So and the Open Window is for a worker that submits any time after the RWP period. So that's where those numbers. But again the key important portion of it, to me anyway, is the worker period 65.1 percent for Johnson Control, which is a little bit lower than all these others, but you can see except for Others and Total. But the big three here, that is the lowest.

Okay. Now I want to talk about plutonium results for Johnson Controls, ES&H, NMT and other groups. NIOSH feels we established there's a considerable amount of data available on which to base a co-exposure model for plutonium at LANL. However, when you break the data into groups, some groups have more plutonium data than others, and we've seen that.

Therefore, it is of interest to compare some measures of relative exposures of the groups, to see if the groups with less data are more highly exposed. An appropriate measure of the exposure to each of the four groups is the plutonium and urine analytical results for the groups.

So we've pulled together a graph. If you look at this, this is a comparison of plutonium-239 in urine for Johnson Controls, ES&H and NMT workers. If you look closely, the NMT and ES&H are slightly higher, and then the Johnson Controls. But all of them are relatively the same.

So again, and I repeat that. The data for the four groups are similar, with NMT and ES&H being slightly

higher. The few relatively higher results from plutonium-239 for Johnson Control workers appear to have been from a single event.

I'm going to the summary and conclusions. So in summary, we compared the BEST versus the in vitro data set. 85.7 percent of the sample requests were fulfilled. We looked at the HPCs versus BEST. 97 percent of the additions of BEST were matched or 97 percent of the additions of the HPCs matched BEST, and compliance with RWP required sampling.

Approximately 97 percent of the 2,252 RWPs had 50 percent or more of the workers monitored, and this was for plutonium, and a comparison of plutonium in vitro results across various groups. Results were similar across groups, with ES&H and NMT slightly higher.

So in conclusion, the evidence supports the conclusion that plutonium bioassay data reported by LANL in the 1996 to 2001 study period, a period including a significant portion of the most highly exposed workers, the data is adequate to construct a co-exposure model for plutonium. And that's all I have on RPRT-0102.

Chair Beach: Thanks, LaVon. Are there any questions from the Board?

Dr. Roberts: Josie?

Chair Beach: Yes, sure.

Dr. Roberts: If I could just quickly interject, just that moving forward, if I know disagreements have been expressed. But if everybody could just be mindful of tone as we're getting into questions and discussion, that would be appreciated. Thank you.

Chair Beach: Sure, thanks. Any questions Work Group Members?

Member Lockey: Hey LaVon, Jim Lockey. Can you hear me?

Mr. Rutherford: Yes, yes.

Member Lockey: So when I went through this report, it is comprehensive and it takes some time to go through the details. So if I ask a question that is obvious, the answer's obvious, excuse me for that. But there were 19,500 RFW, RWPs, and then there were 1,942 PALs or plutonium assay lists. Can you review that again for me, what that means?

Mr. Rutherford: Let me get back to where -- do you remember which slide that was?

Member Lockey: No, it was in your report.

Mr. Rutherford: Oh, I'm sorry.

Member Lockey: It was in the original report. It wasn't on a slide. So like go through the original report. I was trying to think, the PALs were significantly less than the RWPs, and that's because that most RWPs didn't deal with plutonium or --

Mr. Rutherford: No. Actually it's because that individuals could be on the plutonium access list already, and they would not show up. Where an RWP would identify specific requirements and one of them may be plutonium monitoring. However, that individual could already be on a routine monitoring program. And so that's why you have such a larger number of individuals that compared.

So some of those are in a routine monitoring program under Safe Operating Procedures, and some of those are added to the plutonium monitoring from the RWPs. But they could already be on that program as well.

Member Lockey: So that 1,942 figure are people that are already on it or have been added? Is that what that number represents?

Mr. Rutherford: And I'm trying to --

Member Lockey: I wish I would have written the page

down.

Mr. Rutherford: Tom, Liz, can you help me out here?

Ms. Chalmers: Yeah. Bomber, this is Nancy. It's actually on your slide right before the Data Analysis section. That slide right there.

Mr. Rutherford: Ah, there you go.

Ms. Chalmers: So it's 19,568 signatures, and then that's from 1,942 workers. So about ten signatures per worker if you are going to talk about it. So that's all that is. On average, a worker signed in about ten times.

Mr. Rutherford: Right. I totally missed what you were asking there.

Ms. Chalmers: I think that's what he's asking about.

Member Lockey: That's what I was asking, trying to figure out.

Ms. Chalmers: Yes.

Mr. Rutherford: Yeah. That's what, you know, exactly what Nancy just said there, too, is if you average that out, it would be on average a worker, you know, each worker signed ten acknowledgment sheets.

Member Lockey: Okay, and then in your report at Section 7.0, it said that on the BEST list, they could migrate from the BEST list to a new database. What does that mean?

Mr. Rutherford: Well, over time they have switched systems. I mean BEST was originally one of the systems, you know, and they put it in BEST. But then they switched from BEST to another system, and all of that data would be migrated over to that. And so if that -- if for example, if the sample was out for it was on the BEST system for to send it in but they were migrating the system, it might not have ended up in that old system. It would end up into the next

system. Does that make sense?

Member Lockey: But the data wasn't lost, right?

Mr. Rutherford: Right.

Member Lockey: It's just --

Mr. Rutherford: Right. If the data got into the -- if the sample was sent and we got into the in vitro data set, it was there. Yes, we got it.

Member Lockey: Okay, and one other question on Section 7.2 is what did you mean by low recovery, meant by "low recovery" at collection. I wasn't sure what that meant.

Mr. Rutherford: And I think Tom could -- and Liz can explain that better than I can.

Mr. LaBone: It's low radiochemical recovery on the sample. So if you're familiar with how they run plutonium urine samples, they will put a tracer in it to determine how much of the plutonium they lose in the chemical purification process.

Member Lockey: Okay.

Mr. LaBone: If it's below a certain QA level, they will resample it.

Member Lockey: So they automatically would resample it then?

Mr. Rutherford: That's the -- yeah. That's the usual procedure if you again have a QA problem with the sample in the lab.

Member Lockey: Okay, gotcha. That's a QA issue, all right. Well, I have other questions, but I'll leave it open. I'll stop now for a second.

Chair Beach: Now if you have other questions, go ahead Jim.

Member Lockey: Okay. So LaVon, when you went

through all this at the beginning, at least on the paper, on the document, you asked a question are there enough inadequacies to say that the co-exposure model was not adequate? So I looked at what you went through and the various parameters that you were looking at, but can you answer -- based on where you are today, can you answer that question?

Mr. Rutherford: Yes, I think we can answer that question for plutonium, that there is enough data and there are no -- deficiencies have not been identified to date that would prevent a co-exposure model from being developed.

Now that's not to say when we actually get into doing the detailed development of the co-exposure model in accordance with the IMP guide, that there might not be issues come up.

Member Lockey: So based on the Johnson Control, what 71.8 percent, you think that's adequate at that percentage to --

Mr. Rutherford: Yes we do, given the other parameters. The fact that the -- that the -- if you looked at the urine data set, you know, the graph itself, if you looked at that, how they compared to the other two, ES&H, NMT, they were lower than them and kind of went right along with that.

If we looked at overall, you know, who implementation and of following the RWPs and such, yes I think it is adequate.

Member Lockey: Is there any data that you know that are -- that would, that would really fill in the question of your conclusion here? In other words, is it -- what I'm trying to figure out is that you laid out a game plan here and you looked at the databases that are available and how you can go through them. But have you really tested to see that it's really truly adequate?

Mr. Rutherford: Yeah. I think we have. You know, I'll

get Tom to give me his thoughts on this. Mr. LaBone: Can you elaborate on what you mean by "truly adequate"?

Member Lockey: Like the Johnson Control, there's 29 percent that are missing, okay. So I'd like to know something about those 29 percent. It may be the data's not available. Is there a way to look at that 29 percent and say based on all the data that's available, we think we will -- the results that we have available will actually reflect the ones that are missing?

Mr. LaBone: Yes.

Member Lockey: I mean we're looking at percentages. Is it -- I'm trying to figure is your conclusion based on these percentages, or is it based on something above and beyond that?

Mr. LaBone: Yeah. We went through basically the philosophical discussion of the co-exposure models in the beginning of the report, and it was to identify, you know, when does that break? When can you not do a co-exposure model?

Member Lockey: Right.

Mr. LaBone: And what we say is that if you are missing a significant portion of the most highly exposed people, then you can't come up with a bounding model. And so the question is, you know, to look at are the people who are missing, how many of them, and are they the most highly exposed people.

And you know, to truly answer those questions, you'd have to do something along the lines of like an ER sort of an evaluation, to go in to look at all the documentation and so forth and say, you know, there's no infeasibility here, that we have captured a significant portion of the most highly exposed. So I don't think you can just look at the percentages and then decide out of context can you or can you not do this.

So again, it would require when we actually, redo the co-exposure models for LANL, is that that will be part of that process.

Member Lockey: All right. So then your step forward if we agree with you would be you're going to then test this to make sure you have not missed a significant portion of high exposure people?

Mr. LaBone: Yeah. I think the thing we need to ask is okay, the Johnson Controls workers who did not submit HP checklist forms, could they have gotten in frequently to do plutonium work under an RWP that required bioassay? Because they would not be on the PU access list, and so how robust was the RWP basically pre-job briefing and screening process to, you know, not allow those people to work on that RWP?

And so we didn't, we didn't do that, but that would be something to look at. If that was a pretty robust program, then I can, you know, we can conclude that the people who in Johnson Controls who did not submit an HP checklist didn't get into to do work, because there was something there to stop them from doing radiological work with plutonium.

So that's the kind of thing that you would look at when you were doing the complete study.

Member Lockey: That's if you move forward with this, that would be the path you would take?

Mr. LaBone: Yes. If we again go to -- I think LANL has a co-exposure model running. When we go to redo it, to bring it up to the IMP Guide standards, is that that would be a question to ask and how good was the screening process to stop people who weren't qualified from getting into rooms or facilities that required RWP for plutonium sampling.

Member Lockey: Thank you.

Chair Beach: Thanks Jim. Gen or Brad, any questions for LaVon?

Member Roessler: I have. Well, mine's not so much a question as just to make a comment at this point. I agree with Dr. Lockey, this is really an impressive database, and I think, sat here listening to this thinking as to what is our responsibility as Board Members and Work Group Members? I think we have to keep in mind the goals of the program, and which we can go back and look this all up.

But it's always to use the best science available, and certainly if we can use an entire set of data to develop exposure models, that's the approach that should be used. I don't think that as Board Members and Work Group Members, and again we maybe need some legal advice on this, that we have any authority to actually reject something like this as an attempt to use the best science.

So I guess my thought at this point, since I'm not a statistician, I'm not as knowledgeable as Dr. Lockey in evaluating data, even though I think it's impressive, I think we ought to take the next step perhaps direct to NIOSH to go ahead and develop the exposure models or the co-exposure models, or take the step to have this reviewed as an appropriate approach by SC&A.

Chair Beach: Thanks, Gen. Anything else Brad?

Member Clawson: Yeah, I've got a question. NIOSH defines what as Notable base on plutonium. How many other RWPs for primary nuclides were obtained?

Mr. Rutherford: You know Brad, I don't know offhand how many were obtained for the other primary radionuclides, meaning like uranium and tritium or --

Member Clawson: All the other primary nuclides.

Mr. Rutherford: I do not know the exact number. Somebody's got their phone to where I'm getting an echo here. Yeah, I don't know the exact number. But

again, I think if you listen to Report 0101, you're going to find that based on the survey data and the air monitoring data in Report 0101, that the unmonitored workers, you know, weren't likely to exceed 100 millirem, and that's a big factor in this.

Now I mean we have other RWPs that we are looking at, to see if, you know, additional work should be done and, you know, we'll wait and see.

Member Clawson: Yeah. You focused on one, which is a big actor there. But there's a lot of other ones that play into it and --

Mr. Rutherford: I think, you know one -- yeah, it's a good point, I mean an excellent point that we did only focus on one, and but I want to remind you of a couple of things on the plutonium issue. You know plutonium, we know we've got all of these different data sets to look at, to see and get a comparative against to see if we were negatively affected by people not leaving their bioassay samples, you know.

And as I said earlier, why would an individual worker be -- say okay, I'm not going to leave it for plutonium, but I'm going to -- I'm going to leave it for plutonium, but I'm not going to leave it for these other radionuclides? The other issue we have is if the individual, if we had an RWP and Health Physics and Internal Dosimetry said well, you don't have the potential to exceed 100 millirem on this -- well, for this work.

And if they look at the radionuclide of concern and they say you don't have enough potential to exceed 100 millirem, you don't have to be bioassayed. We're not going to have bioassay data. So we'll have -- we have a ton of RWPs, you know not -- I won't say a ton. We have a lot of RWPs where there are no bioassay requirements because a determination was made individuals would not exceed 100 millirem.

Honestly, that's supported by Report 0101. I think it's just -- if you didn't hit certain thresholds, you

know, the Internal Dosimetry Program and the Health Physics staff would not require a bioassay sample. So with plutonium, most of the heavy work, especially the most hazardous work, was with plutonium, and so we could use -- we could use that.

Member Clawson: Well, it was -- plutonium was used as a requirement, as a condition to be able to answer even into the facilities. So all of these people get into this and you start talking about the 100 millirem and everything else like that. Well there's a lot of other actors that play into this as well as you know, and that's what I want to make sure.

But let's, let's go on to something else. You talked and kind of discarded the findings of this team that came in there to evaluate what the, what the LANL's whole process was, and if there was any shortcomings that could make them susceptible not to be able to monitor people correctly.

You kind of dismissed that a little bit by saying well, there wasn't any kind of finds or anything else like that, because that was self-reported. Now if I'm not mistaken, they only have two of those people that are part of this paper?

Mr. Rutherford: Yeah. Two of the individuals that were on that assessment yes were -- are on that paper.

Member Clawson: Okay. The other thing is, what came out of that? What changed at LANL?

Mr. Rutherford: Or there was things that changed at LANL. They did recognize, as you pointed out or as I pointed out, as was pointed out, that there were issues with the Health Physics Checklist. They removed, they moved away from the Health Physics Checklist Program and moved to the electronic database.

And in fact in 2001, they pretty much went to an electronic system, where all of the work plans and

work processes were done electronically, and that would limit the fact or limit the chance or prevent the chance anyway, or limit or prevent the chance of individuals not submitting appropriate paperwork, because they would have to go through and basically make sure everything was checked off, Internal Dosimetry, whatever, when they were developing a safe operating procedure.

Or if when RWPs process was in place, they still all went into the safe operating procedure. I can't remember exactly what the electronic database was called. But yeah, there were a lot of changes that were made from that.

Member Clawson: Yeah, and one of them that I found was interesting was they developed a LANL-wide dosimetry enrollment criteria, facility-specific dosimetry matrix, and implementing a new bioassay enrollment process. There was a lot of changes that happened because of --

Mr. Rutherford: That was part of that electronic system I was talking about.

Member Clawson: Right. They, a lot of things changed on this, and this wasn't just implemented overnight. They showed weaknesses, and I believe when the question was asked to LANL, this group of people told them that yes, your ability to be able to monitor people safely is not up to speed. So I don't think we can really sit back and really disregard that because I -- there was so much that came out of that and change-wise, that it's pretty interesting.

Mr. Rutherford: Well I'm not disregarding it at all. I mean there were definitely issues with that. But you know, that was part of the discussion on regulatory compliance versus being able to do dose reconstruction. If we got the data, you know, if an individual -- remember, I mean, if we have enough data to do dose reconstruction, that's the key, whether the individual was in compliance or not or whether the site was in compliance or not. And right

now at this point for plutonium, we feel like we got that data.

Member Clawson: Well, I guess we'll see.

Mr. Rutherford: Okay.

Chair Beach: Okay. If there's no other questions, I think we should move on to Report 0101, and then we'll circle back around for the end discussion on tasking and where we are moving forward, if everybody agrees.

Member Lockey: Okay. I'm good with that.

Mr. Rutherford: So we're just jumping now, jumping to 0101?

Chair Beach: Yes.

Mr. Rutherford: All right. Can I get a drink?

Chair Beach: Sure.

(Pause.)

Mr. Rutherford: Okay, can everybody see my screen?

Chair Beach: Yes.

NIOSH Presentation: ORAUT-RPRT-0101, Bounding Intakes of Exotic Radionuclides at Los Alamos National Laboratory

Mr. Rutherford: All right. Let me see if I can -- okay. We went through 0102. Now I'm going to talk about Report 0101, Bounding Intakes of Exotic Radionuclides at Los Alamos National Lab. I'm going to talk about background, report overview and summary and conclusions.

Okay, some background. As part of the evaluation of SEC 109, NIOSH concluded dose reconstruction was not feasible for all employees at LANL from 1976 through 1995, based on the inability to bound unmonitored exposures to exotic alpha emitters,

fission products and activation products.

NIOSH found that dose reconstruction is likely feasible starting in 1996, with the implementation of 10 C.F.R. 835. At the November 2018 Work Group meeting, SC&A indicated they found no substantiation for NIOSH's belief regarding exotic radionuclides. Just because they may have controlled for the primary radionuclides doesn't mean they did for the exotics.

SC&A felt that they had a program on paper, but there was not enough data and evidence to support that -- for them to conclude that 100 millirem was bounding for unmonitored workers. So after the Work Group meeting in November 2018, we had many discussions on the path forward for addressing mixed fission, activation products and exotics.

Our approach was to identify radionuclides of concern, determine the air concentrations required to get 100 millirem, identify areas where the potential for exposures to mixed fission activation products and exotics, capture air sample data from these areas and then from these areas identify areas of greatest concern, and then compare actual air concentrations to those required to get 100 millirem CEDE.

We expanded that somewhat by not just looking at air sample data, but also getting surface contamination area data and establish a limit for contamination being resuspended.

For an overview, so the report addresses the issues of bounding doses for exotic radionuclides for LANL workers from 1996 through 2005, using surface contamination survey data, air monitoring data and personal contamination monitoring to comply with 10 C.F.R. 835. Exotic radionuclides include short-lived activations, spallation products from Los Alamos Neutron Science Center, LANSCE, and mixed fission products in TA-3 and TA-48.

The report also addresses heavy elements of

actinium-227, neptunium-237, americium-241, curium-244 and thorium.

Workplace monitoring. Workplace monitoring was used by LANL Health Physics to ascertain the effectiveness of the workplace controls, in compliance with 10 C.F.R. 835. This was one of the issues that was brought up by SC&A, where they thought they had a good, you know, they had a good program on paper, but they really didn't see enough data yet to see if it was done in the field.

I think the data that we've seen actually in this group supports that, that it was happening in the field.

Site-wide procedures addressing various aspects of radiological protection. Very specific monitoring instructions, which include survey locations and frequencies, and published routine monitoring instructions for each area. In addition to routine sampling, LANL used continuous air monitors with alarm capabilities.

They also had a Hazard Index. A Hazard Index of less than 1 indicated a low hazard potential from airborne radioactivity, and no air monitoring was prescribed. A Hazard Index of 1 to 100 indicated increased potential for airborne radioactivity and general air monitoring was prescribed. A Hazard Index of 2 corresponds to the two percent of an ALI, which equates to the 100 millirem.

In addition to routine general air sampling, LANL also used continuous air monitors with alarm capabilities, as I indicated I think already. Workers were required to frisk when exiting high contamination areas, airborne reactivity areas, contamination areas, buffer areas and controlled areas. LANL maintained and operated a large inventory of portal monitors consisting of personal contamination monitors and hand and foot monitors.

Now if you look at the report in Tables 2-2 and 2-3, you'll see that large inventory of PCMs and hand and

foot monitors. NIOSH got examples of personnel alarming the portal monitors and the action taken. Table 2-4 lists examples of the incident reports involving the use of portal monitors.

To evaluate the effectiveness of the LANL radiological control program, we analyzed contamination survey and air monitoring data. Routine smears and air sampling surveys were selected from TA-3, TA-48 and TA-53. These TAs were selected because of their known work with exotics during the 1996 through 2005 period.

Now we pulled background information from the smear and air survey data, including date, TA, building number, survey frequency and the number of results. The data collected from the smear surveys included results exceeding 20 dpm per 100 square centimeters alpha, and 1,000 dpm per 100 square centimeters beta. Those are the LANL action limits, but if -- so those are listed in their RadCon manual, but those are the same action limits that are in 10 CFR 835.

ORAUT derived limits associated with 100 millirem, with 400 dpm per 100 square centimeters alpha and 3.2 million dpm per 100 square centimeters beta, and I'll talk a little bit more about how we came up with those numbers. So our purpose for compiling this data, I want to demonstrate the samples taken in these areas was substantial.

So if you look through the report, you can look at the tables and there were large numbers at this table. I also wanted to determine the likelihood an individual could receive a significant intake. The purpose of collecting the 100 or collecting smear data exceeding 400 dpm per 100 square centimeters alpha and 3.2 million dpm per 100 square centimeters beta was to assess the likelihood of an individual exceeding 100 millirem.

And I want to throw out, you know the thought process here is if we don't have a lot of personnel

monitoring data, the question of the 100 millirem is significant. And so looking at these areas and deciding whether, you know, there was a potential to exceed 100 millirem was of greatest concern.

So we looked at previous LANL documents, evaluation reports, Work Group meetings and associated papers and those indicated the following radionuclides with limited data: mixed fission products, mixed activation products, americium-241, thorium-232, thorium-230, protactinium-231, neptunium-237, curium-244 and actinium-227.

So we wanted to identify worse case radionuclides. Of these radionuclides, ORAU evaluated which alpha and beta emitter would require the smallest amount of surface contamination to be resuspended and a worker exposed for a year to receive 100 millirem CEDE for both alpha and beta.

So what we're looking at, if you think about it, you have derived air concentration limits for each of these different radionuclides. However, if we take that each one and we look at which one is going to require the least amount of surface contamination to be resuspended, and then we're going to get -- and from that get the 100 millirems CEDE. What we found was actinium-227 was our worst alpha emitter; strontium-90 Type S worse beta emitter.

But I want to point out that, you know, strontium-90 Type S is not what we would expect to see at LANL. We would really expect to see Type F. But we used Type S, because this was a little more conservative.

All right. Data collected from the air sample surveys included results exceeding .04 dpm per 100, per cubic meter alpha and 320 dpm per cubic meter beta. The limits associated with the air data are just derived limits. We did not pull any action limits from LANL. The purpose of collecting air data exceeding .04 dpm per cubic meter alpha and 300 dpm per cubic meter beta, was to assess the likelihood of exceeding the 100 millirem.

Again, actinium-227 and strontium-90. The only difference was the conversion and the resuspension factors that made up the difference in the numbers. So contamination surveys and airborne data results, Table 3-1 summarizes the monitoring results for all three TAs as a whole individually. Table 3-2 shows the results by year, and Table 3-3 through 3-5 are summarized below.

A review of the data shows that over 98 percent of all smears and 99 percent of air monitoring data were below. That needs to be corrected. It should say a review of the data shows that over 98 percent of all smears were below the lower limit of alpha contamination and 99 percent were below the ORAU-derived airborne limit, alpha limit.

The evaluated data does not represent a random sample or all the data, but the data suggests the workplaces were well controlled. So again, you know, we didn't develop a sampling plan on this. What we did was we pulled all the data, we did a number of data captures, I believe there was nine requesting data from LANL to cover these different Technical Areas, and we got all this data and from that data we did the analysis. We included all the data that we got.

The results exceeding the limits still need to be evaluated further. So if we look at our breakdown of the smear survey, again these next few tables are 3-3 through 3-5. I took some of the information, I didn't take all of the information from it for the presentation. You can refer to the report to get the rest of the information.

As you can see, there was a lot of data, 40,717 smears over the study period, and over half of them were from TA-53. If we also remember -- well, when I talk about TA-53 more, about the size, you'll understand why. But if you can look at the percentages, overall percentages is 1.2 percent exceeding the lower limit, and that's the lower action limit.

That is not a limit that could possibly give, if generated and you're exposed to it for 2,000 hours, give you the 100 millirem. And so again, it's just the LANL action limit. So if you look at the breakdown and results above the drive limit, now this is the limit associated with the 100 millirem.

If you look at all of these, overall it is exceeding the upper limit. It's all less than one percent. In fact, it's .04 percent for all the areas combined. And so this is the upper limit associated with the 100 millirem, and I'll talk about each TA in a little more detail. And this third table is the air concentrations. Again, we have 67,067. The overall exceeding the 100 millirem limit is less than one percent. TA-53 is the worst at seven percent.

All right. So I'm going to talk about the Technical Areas. TA-3 has a mixture of LANL activities that included bench scale operations, larger radiological operations, the chemistry, metallurgy, research and Sigma Complex. That CMR is the chemistry, metallurgy and research.

CMR's actinide chemical and metallurgy research and the Sigma Complex was associated with material fabrication. All smears with alpha plus beta results were from Radiological Buffer Areas or Contamination Areas. I'll talk about that a little further. Surface contamination was not found in the same location for over two consecutive days.

So you think about this. If you had a smear that exceeded a lower limit, for LANL a lower limit, not the derived upper limit but a lower limit, if it was there, they would either clean it up or post it as a Contamination Area, and but if for -- and eventually clean it up.

Okay. There were 28 smeared spots that exceeded the derived upper limit for alpha or 100 dpm 100 centimeters squared. No spot exceeded the derived upper limit for beta gamma or beta, excuse me, 3.2 million dpm per 100 centimeters squared. 17 of the

28 smeared spots were found in the Sigma Complex area, where uranium was the radionuclide of concern, and the other 11 smears exceeded the upper derived limit were found in CMR, where actinides were a primary source of concern.

All smears with the alpha plus beta results exceeding the limit were taken in Radiological Buffer Areas or Contamination Areas. So if they exceeded the limit, it was already in an RBA or a Contamination Area, and that's really important because there were specific controls for going into those areas.

Surface contamination smears were below the derived upper limit, 99.87 percent of the time. Survey spots with readings above the lower LANL surface contamination limit were posted and/or claimed in the survey. So given this information and considering the minimal number of surface contamination samples above any limit, the minimal amount of time potentially exposed, routine workers would not be exposed to surface contamination for a year to exceed 100 millirems.

Airborne contamination results exceeding an alpha or beta limit were found on 119 sets of results for TA-3. Those were all in CMR, and we say "sets of results." Sets are a grouping of airborne results from the specific location. An example would be on January 26th of 2000 in TA-3, Wing 5, there were 67 results and only one exceeded the limit.

Okay. All were for alpha results exceeding .04 dpm per cubic meter, and all 179 individual air monitoring results exceeded .04 dpm per cubic meter. A set of individual air monitoring results that exceeds the limits is .15 percent of the total air monitoring. So less than one, much less than one percent.

Now I'm going to talk about TA-48. TA-48 is know is the radiochemistry sites, holding research and development and nuclear and radiochemistry. Radiochemistry A or RC-1 was the only building of radiological concern. RC-1 activities included small

scale radiochemistry, chemical research of high alpha activity in the alpha facility, sample counting room, small scale production of medical radioisotopes. The radionuclides used in these locations primarily included actinides and mixed fission and activation products.

Surface contamination smears exceeding either the lower alpha or beta contamination limit were found in 56 surveys, all in RC-1. All smears exceeding the lower LANL surface contamination limit were found in a Radiological Buffer Area or Contamination Area. Again, specific controls to get into those areas.

From the 56 surveys or 7,888 smears, alpha contamination exceeding the lower limit, LANL limit was found on 57 smears and beta contamination on 54 smears. Individual smears exceeding the lower LANL limit were .7 percent of the total number of smears, again less than one percent. As for the derived upper contamination limit, no smears exceeded the beta limit, and there were four smears that exceeded the upper alpha limit.

Of the total number of smears, 99.9 percent were at or below the derived upper limit. Again, survey spots with readings above the lower limit, which was again from the LANL RadCon manual in 10 C.F.R. 835 for surface contamination, were posted appropriately and/or cleaned and resurveyed. I just want to remind that, even though we've indicated that 99.9 percent were at or below, so --

Airborne results. Airborne contamination results exceeding the derived limit were found on ten sets of airborne results for TA-48. All were from RC-1. 29 individual air monitoring results exceeded the derived alpha limit. No beta results exceeded the derived limit. So of the total monitoring results, .45 percent exceeded a limit, again less than one percent.

Talk about TA-53. TA-53 has LANSCE. During the period of evaluation, TA-53 had approximately 400

buildings and other structures, and about 800 personnel, a large area. There were many controls established to protect workers, including shielding, fencing, access controls, sweep procedures, beam shutoff mechanisms, monitoring devices, dosimetry, posted safety information, training, other administrative controls and emergency response mechanisms.

Radionuclides of interest in this area were primarily actinides and mixed activation products. Surface contamination exceeding either the lower LANL limit was found on 46 surveys. All smeared locations were in areas that LANL monitors for external exposures and intakes. From the 46 surveys, which included 24,058 smears, alpha contamination was found on 107 smeared spots and 59 beta -- alpha was on 107 smeared spots and 59 spots with beta.

Okay. The set of individual smears exceeding the lower LANL surface contamination limit is .34 percent of the total smears available. Again, that's one percent. Considering the derived upper limit, ORAUT found three smear spots exceeding the alpha limit, and no smear spots exceeding the beta limit.

One spot experimental area, in the experimental area in MPF-3M and the other two in the beam target area. This equates to 99.9 percent of all smeared spots were at or below the derived upper limit. Again, surveyed spots with readings above the lower limit with surface contamination were posted appropriately and/or cleaned and resurveyed. Air monitoring results for air monitoring samples analyzed for gross alpha and beta contamination. 286 individual monitoring results exceeded the derived upper limit, and 14 exceeded the derived beta limit. A majority of these results were reported for Experimental Area A, where 185 individual air monitoring results exceeded the alpha limit, and 9 individual results exceeded the beta limit.

That's not unexpected, given the activation products arising from the spallation process. The said air

monitoring results that exceed the alpha beta limit is about seven percent of the total air monitoring results. Air monitoring results represent sampling at the target area, along the beam line and at the surface area in ancillary support facilities. Recognize that no one's going to be around when that beam is activated.

The majority of the results exceeding the limit were found in Experimental Area A, as I discussed.

So, our Technical Area summary. While the analysis included smearing, contamination, surface and air monitoring data from three TAs, the results of smearing air monitoring data demonstrate that LANL effectively controlled radioactive contamination. Radionuclides of interest for the period of evaluation were primarily actinides in TA-3 and TA-48, and included activation and fission products. Spallation activation products, as well as alpha emitters including plutonium, were of primary interest in TA-53.

Summary and conclusions. A list of summary and conclusions. In the report, LANL Radiological Control Program is discussed and demonstrates that contamination was well-controlled in TA-3, TA-48 and TA-53. They show LANL controlled routine contamination that could lead to doses greater than 100 millirem. The LANL Radiological Control Program included the use of portal monitors to identify and remediate workplace contamination.

It required frisking upon exiting Contamination Areas, Hot Contamination Areas, airborne reactivities and radiological Buffer Areas. Examples of PCM alarms and responses were provided. The weight of the evidence clearly indicates that workers' doses to unmonitored exotic radionuclides were not likely to exceed 100 millirem.

Doses for workers monitored by a bioassay can be bounded using bioassay results. So if we have bioassay results, we can bound the workers' dose

using that. If the workers are unmonitored, it's pretty clear from this report that the unmonitored workers were unlikely to exceed 100 millirem. Therefore, they could be bounded at 100 millirem, and that's it. Sorry.

Chair Beach: Thanks, LaVon. Questions from the Work Group Members, comments? Member Roessler: I have some questions, Josie.

Chair Beach: Oh, please. Go ahead, Gen.

Member Roessler: Okay. We just got this report this morning, so maybe some of my questions are kind of native, but I do have a few things marked here and the pages aren't numbered. So I don't know how we're going to do this. But if we could go back to your slide, it's probably Slide 3 on background.

Chair Beach: Yeah, Slide 3.

Member Roessler: Okay. I guess my first question is, looking at --

Mr. Rutherford: Hold on. For some reason, it jumped away. I don't know why it did that.

Mr. LaBone: I think if you just hit escape you'll be back there.

Mr. Rutherford: Yeah.

Member Roessler: Okay, that's it. Now Bullet 2 as I read that, I was wondering. This is I think an interesting and a valid approach here. Is there precedents in other sites for using the 10 C.F.R. 835 to set this -- to set up a limit below which you don't have to do measurements?

Mr. Rutherford: Well, you know, that's interesting that you bring that up Dr. Roessler. We actually introduced that on LANL a number of years ago. However, the issue was brought up that -- by SC&A mainly, that until you verified that the site had actually implemented the requirements of 10 C.F.R.

835 and had shown that they were following it and complying with it, they felt like setting a date, a specific date would not be a good idea. It would require further analysis.

So that's why we have done additional work, and especially here at LANL. So LANL is really the first site that looked into this, the 10 C.F.R. 835 period, and all of the sites we have taken over the approach that we're not just going to assume compliance at the 1996 period when, you know, 10 C.F.R. 835 was promulgated, but we are going to actually look at the data to try to determine if they were truly compliant with 835.

Member Roessler: And so at LANL, it's clear it was implemented?

Mr. Rutherford: Yes, and I want to say compliant with 835 for the 100 millirem, you know, because as I spoke on 0102, you don't have to comply with everything in order for dose reconstruction to be feasible, if we are getting the bioassay data needed to -- for the information, the data needed in order to support dose reconstruction.

But in order to set the bar at 100 millirem, you know, we needed to be able to see if they were controlling these areas in accordance to ensure that individuals would not exceed the 100 millirem. We have shown that with -- we were looking specifically at TA-3, TA-48 and 53, because of their concern with exotic radionuclides and our limited data associated with them.

Member Roessler: Okay. That brings up the next -- I guess this is a comment in that last bullet, where you clearly state the 100 millirem per year CEDE. That's the correct way to state it. But throughout your presentation and the written report, you leave out the per year.

That bothers me, because even though it's implied all the way through here, it bothers me that somebody

could pick up a report and see that 100 millirem and say well, per unit of time is really important. Is that per job or is that per this SEC period or what is it, and that's just a comment, that I think in really important statements throughout this you should always have the per year. Do you see what I'm complaining about?

Mr. Rutherford: Yeah. I didn't pick that up.

Member Roessler: I don't know. That always kind of bothers me when people talk about dose, and they don't say per unit of time. So that's just a comment there. But okay, now I've got a few more I think here.

Chair Beach: Before you move on Gen, I wanted to make a comment about your first comment about the -- that bullet about 10 C.F.R. 835. Doesn't the 1999 report dispute that LaVon?

Mr. Rutherford: Well, that's one of the things that drove us to change our idea that 1996 was the right date for setting our, you know, for whenever 10 C.F.R. 835 was promulgated, and in 1996 everybody was supposed to be in compliance unless they had indicated, provided information that they would not be in compliance at given dates.

So we had set 1996 was the initial thought. If they were in compliance with 835 then, then 100 millirem would be a good limit. However, I will say that the 1999 audit brought into question the -- not only, it was more questions associated with the bioassay program and whether individuals were leaving appropriate bioassay.

It did not bring into question specifically the routine monitoring, field monitoring program. It was more associated with the bioassay program and individuals leaving the appropriate, whether they were leaving the appropriate bioassay samples, and we did address that 0102.

Chair Beach: Yeah, yeah I know you did. I just found

that to be a little misleading, that it's likely feasible. So that was just my comment.

Mr. Rutherford: Yeah, yep, and a good comment, because we initially said that it was likely feasible, and in fact our addendum I think I reported, we said it was feasible until we got into NCID-484 -- yeah I think it's 484 -- and also based on SC&A's comments that there wasn't enough data there to support the belief that 100 millirem was bounded.

So I think what our report is trying to show that here's a lot more data here, and we still feel like that 100 millirem is bounded.

Chair Beach: Okay, go ahead Gen.

Member Lockey: LaVon, can you hear me?

Chair Beach: Yes, I can.

Member Lockey: I'm sorry. Were you done?

Member Roessler: Go ahead.

Member Lockey: So in relationship to the paper, you said that there's a Hazard Index of 1, less than 1 to 100, right?

Mr. Rutherford: Yes.

Member Lockey: And that had to do with I guess in relationship to surface samples as well as air monitoring; correct?

Mr. Rutherford: The 1 to 100 is for airborne monitoring. A Hazard Index of less than one indicates low potential for, from airborne radioactivity. That could be -- I mean yes, it could be if the surface contamination in the area was high enough. They may identify that the area, you know, should be a Hazard Index of, you know, 2 or above.

Member Lockey: How did the facility break down in that Hazard Index criteria?

Mr. Rutherford: You know, I'm not sure about that. I don't know that we looked into that. Mike or Rich, do you know?

Mr. Mahathy: We didn't do further -- this is Mike. We didn't do a further check into that.

Mr. Rutherford: Yeah, I didn't think so.

Member Roessler: Was Jim's question -- I had a question there. Was your question how do they determine a Hazard Index?

Mr. Rutherford: I think we're --

Member Lockey: It wasn't how they determined the Hazard Index. I was just wondering, they assigned Hazard Index I guess to certain areas within the facility. I was wondering, I was wondering what that breakdown was, you know.

Mr. Mahathy: We would have to get that -- basically we included that to show it was part of the rigor of the program.

Member Lockey: But you can't tell me if 50 percent of the facility was a 2 and the rest was a 1 or 1 to 100, right? Less than 1 to 100?

Mr. Rutherford: No.

Member Lockey: Okay. That's what I was asking.

Member Roessler: So my question on that is how -- and again we just got this, so I haven't had time to think about it. How do they determine the Hazard Index? Is it by first knowing the alley and then they get HI?

Mr. Rutherford: Again, I don't know the details of that. Rich or Mike do you know the details?

Mr. Mahathy: Rich?

Mr. Merrill: I don't know. I would have to go back and look at the reference.

Mr. Rutherford: I'm not sure, Dr. Roessler.

Member Roessler: I think we should know that, so I think that's something that we should think about.

Mr. Rutherford: Okay.

Member Roessler: I have another question, if I can continue on.

Mr. Rutherford: Sure.

Chair Beach: Yes. Please do, Gen.

Member Roessler: Okay. From the Hazard Index slide, go about three more under contamination surveys. Yeah, okay there. The second bullet. You talk about the derived limits associated with the 100 millirem, and then you say CED. What is "CED"?

Mr. Rutherford: Committed effective dose.

Member Roessler: Okay. Why do you leave off the equivalent? Does that mean that because you leave off equivalent you're dealing with just the one type of radiation? I'm just -- you know, it's been 25 years since I studied all this. I guess I need to be brought up to date.

Mr. Rutherford: You know, I'll be honest with you. I can't remember myself. So go ahead, Liz.

Ms. Brackett: This is Liz Brackett.

Mr. Rutherford: Yes.

Ms. Brackett: So it's called, it's committed effective dose equivalent in the ICRP-26 and 30 system, but in the ICRP-60 and 68 they changed the weighting factors and some other things, and so they changed the name and it's just committed effective dose in the current system.

Member Roessler: Okay. See, I was afraid I wasn't up to date and that's what it is. So okay, thank you.

Mr. Rutherford: Liz, I forgot that and I should have remembered that.

Member Lockey: Well, isn't committed effective dose organ-specific dose?

Mr. Rutherford: No. It's the dose derived for all organ exposure.

Member Lockey: Right.

Member Roessler: And all weighted?

Member Lockey: Yes, yes.

(Simultaneous speaking.)

Member Lockey: -- for 50 rem, I think, right?

Mr. Rutherford: Uh-huh.

Member Roessler: And I just have one more comment and then I'm done. Just to, and this is the second to last -- well the last two slides in your summary, quite often people pick up, and this is just a kind of whiney comment, pick up the summary and conclusions and look only at that. Again, I'd be very careful there when you talk about the 100 millirem. I think I would be --

Mr. Rutherford: Yes.

Member Roessler: --happier if you put per year.

Mr. Rutherford: Got it.

Member Roessler: And that's it.

Chair Beach: All right, thanks Gen. Any other comments or questions by Board Members?

Member Clawson: Yeah, Josie this is Brad. I do.

Chair Beach: Hi Brad. Yeah, go for it.

Member Clawson: One of the things I want, and LaVon you probably haven't lived through this or

anything else like that. One of the problems that I had with C.F.R. 835 and that 100 millirem is at the time, this is when the contracts were changing with DOE, and they were not cost class. All of a sudden a lot of these starting to become bid.

So this 100 millirem they came up with was if you were below that, you didn't have to participate in the bioassay programs. So this was money. So we're talking money now. There's numerous kinds of people as they get close to the 100 millirem, then they would be subjected not to be able to go in the radiation work areas and so forth like that, to be able to keep them off the bioassay program, because that cost the contractor money.

Now the reason I can specifically speak to this is because this has affected me numerous times. So when you're using the C.F.R. 835, I want you to look at all the weaknesses with it too, plus I want to take an opportunity to -- I have never questioned you guys' ability to be able to generate a good report. You guys are amazing, you're very, very good health physicists, and when I disagree with you on things, it's not because I don't think that you are. You do a wonderful job.

But the thing is, I look at these reports like a cake. It's really beautiful, it's got the roses on it, it's got everything like that. So I really judge these reports after we cut into them and see what they are really all about. If my tone was wrong, I want you to understand my frustration because bottom line is NIOSH unilaterally redirected the review of something different than what the Work Group requested and expected.

I never saw or heard of any changes. Now if I'm wrong LaVon, I apologize. But guess what? Everything you sent to Josie was sent on to Work Group Members, and I have never seen any kind of change. I have been waiting five years, five years to be able to see this. So understand my frustration when we don't even get a copy until today of your

presentations. We have to go out and find 0101 and 0102 to be able to operate and be able to review these things and look at them.

So that was kind of what my frustration was bottom line. I do want to make sure that you understand that I respect all of you as health physicists. I really do, and I've appreciated the time that you take and you sat down with me and explained the whole aspect and why we're going at it. I just want to make it clear what my frustration was and why I was there.

And I just -- I just want to make sure it was very clear what my frustration was and why I was there.

Mr. Rutherford: I appreciate that and I do understand that. I do want to say one thing, a couple of things anyway, that you know, it was decided when I talked to Josie a month or two ago, I thought that, you know, 0101 would be out sooner than it was. We were look at scheduling Work Group meetings before the April Board meeting and trying to get things going.

You know, when we talked about it, we said okay, we'll schedule -- you can do the presentations on 0101 and 0102. We talked between Josie and Rashaun, and we'll task SC&A at that Work Group meeting to review the reports. So I was, you know, it bothered me that I was unable to get the reports out sooner and get the presentations out sooner. But I had anticipated, based on our discussions, that it was going to SC&A for review.

So I felt that even though the Work Group did not get a lot of time to review 0101 and there was other time there, that there was going to be a period there when 0101 and 0102 would have been reviewed by SC&A, and so the Board, the Work Group and SC&A could have brought all their issues at the next Work Group meeting. So that's, that was my thought process, just so you know.

Member Clawson: Well, and I understand that. But

understand where I just came from too, because Savannah River was an ugly process and we went around and around for so many years, and I was really hoping this, that when we came into this, but we're back with the same whole thing. I do realize that timeliness is really of the essence, but it is.

We have a responsibility as Board Members and all of us, and I know that we take it all literally, to the Petitioners and this is just taking way too long. It really is, and I just -- I just get frustrated with it and I apologize if I offended any of you. But also if you'll understand my standpoint of we are as Board Members, if we've even worked in a place or done anything, we're conflicted.

All of a sudden I see a report by certain individuals, and all of a sudden those same individuals are writing the report and contradicting their own report. I really, I have a -- I really believe that's a conflict of interest, and maybe you guys have addressed it and gone through the whole legal challenges on it. But I'll tell you what, it doesn't, it doesn't look pretty and it doesn't smell pretty.

Chair Beach: Okay. I think for me, reading the RPRT-0102 and the fact that our original question was changed was -- it was hard to take to start with, to be honest. What I'd like to do now is talk about tasking. Hopefully we can, I can satisfy all who are members, since we are both on different sides.

Chair Beach: My initial thought is that we should take this to the full Board and go ahead and vote on an SEC. What I would like to do now is discuss a tasking. So moving forward--

Dr. Roberts: Excuse me, I'm sorry Josie. Someone, E. Brackett, needs to go on mute. I think there's an echo. So E. Brackett.

Chair Beach: Elizabeth, yeah.

Ms. Brackett: Sorry about my sound system, how it

started on my computer, too.

Chair Beach: Interesting, but it does happen.

Dr. Roberts: Thank you.

Work Group Discussion

Chair Beach: Okay. So moving forward, I would like to propose that we task SC&A with reviewing Reports 0102 and 0101. On a parallel track, I would also like to have SC&A take a look at all the available RWPs that LaVon captured, not just the plutonium, and I believe SC&A would need to have access to all RWP files.

The original question still needs to be answered, the question of unsubmitted job-specific bioassays and the completeness of the job-specific bioassay data sets, as well as compliance by NIOSH by LANL workers for all of the RWPs, including the non-PU source terms. So I feel like it's important to do both of those together.

I guess I would have to ask SC&A if that's something that they can do if they're so tasked, if their Work Group agrees with that tasking, if they can complete both reports and do the additional tasking of looking at the RWPs that were originally spelled out for the sampling plan.

So I guess I should first ask SC&A if they can take that on, and then if the Work Group would agree to that tasking.

Mr. Barton: We certainly obviously can review the reports. On the question of in parallel doing survey for RWP analysis, that is a very significant chunk of work. I'd like a little bit of time just to see the full data set and sort of come to grips with what that would take, because that is a very tall order. As we've seen, it can take a very long time to do these sorts of things, as NIOSH would certainly attest to.

But we'll certainly do everything we can to obviously

look at both reports, and then --

Mr. Rutherford: Josie, I will tell you that we are, we are looking at the rest of the RWPs right now.

Chair Beach: Pardon me? Go ahead.

Mr. Rutherford: We are, we are looking at the rest of the RWPs.

Chair Beach: Is that something you can make available to SC&A?

Mr. Rutherford: We certainly can.

Chair Beach: The other thing that I think would be important would be in real time, that if there's any tech calls that would need to be made between SC&A and NIOSH, to get a feeling or an understanding of your approach, if that could be made possible, that time frame for tech calls if needed.

Mr. Rutherford: Yeah, most certainly.

Mr. Barton: Yeah absolutely. I mean we certainly have some clarifying questions that probably aren't appropriate at this stage right now. It's, you know, just sort of wading into these reports. But certainly some tech calls would be warranted down the line.

Chair Beach: Okay. So the big thing, LaVon, I think on your side would be making that data available, and then I guess if SC&A feels like they can do that, the Work Group Members, can you weigh in on your thoughts?

Member Clawson: Josie, this is Brad. I'm kind of like -- see, I'd like SC&A to be able to look at NIOSH's study approach, if in fact it was relevant to the one that the Work Group even started with. That should be fairly easy to be able to tell, just in the process that they have going on right now.

Chair Beach: Okay. Gen and Jim?

Member Roessler: I see Jim is muted, so I'll talk. Yes,

thank you Josie. I think this is an appropriate way to go, and I certainly agree with it.

Member Lockey: Hi, Jim. This is Jim. I agree. I think with Brad's comments for Savannah River, I agree that it would be -- there is a time factor here that's important. So I think maybe based on Gen what you said, there's a basic philosophy here, is that are we going to use the best science? Does the best science say yes, the science says we can do dose reconstruction in a very valid manner based on the database that's available?

If SC&A's able to answer that question, is that adequate? Or is it inadequate? And if it is inadequate, where's the objective data that then indicates it's inadequate? I think that's really the proper question. If the best science is not something that is the final thing that we're looking for, then rather than spending a lot of time going forward, maybe there's another pathway we should take and say the best science is not what we're looking for here.

If the best science says we can do good dose reconstruction, but that's not going to be adequate, then that delay is not appropriate I think. That's what I'm trying to raise the issue with here, so and I would address the question to SC&A. Are they going to be able to look at this database in an objective manner and say the data is adequate or inadequate to do dose reconstruction in a valid manner.

If it's inadequate, why is it inadequate in an objective manner?

Chair Beach: I feel like they've always been objective, but I'll let SC&A answer that.

Member Lockey: Looking at it generate data that indicates it's valid. There's not a percentage --

(Phone ringing.)

Mr. Barton: Well, I guess two things here. A lot of times when we say "adequacy," it's sort of conflated

with weakness, and I think that was really the issue that was wrestled with at Savannah River. As far as producing objective data on a completeness front, it's obviously difficult to do because if there's a completeness issue, then you don't have the data to analyze to come up with an objective answer.

Member Lockey: There is. If you have a big database, you can look for -- you can pick pieces out of it and say this reflects that most likely it's not going to be representative. So if you have a small database, I would agree with you. But if you have a large database such as this, then we should be able to find something that says yeah, this is not representative and this is why it's not representative.

(Simultaneous speaking.)

Member Lockey: So I think the question is I don't think we should waste time and extend this out. If we get to the end of it and NIOSH and these scientists say yeah, this is a great database and we're sure that dose reconstruction can be done in an adequate manner. But that's not, that's not going to reach the threshold that our Committee can be comfortable with.

And so maybe we need to go back and say what is the best science and when do we use the best science? When do we use the best science, and when do we dismiss it?

Mr. Barton: I'm not sure if the question was directed at me. I guess I would say when you're talking about completeness issues, obviously there's data that's missing. So as sort of Tom LaBone hinted at, you have to ask yourself a question. What sort of informs that missing data and is there a reason to think that what is missing would affect your ability to construct a coworker model that is representative of the exposed population?

Member Lockey: I agree, I agree with you. That's right. There's always going to be missing data. I've

never had industrial hygiene data where there wasn't missing data, ever in my whole life in large databases. There's always going to be missing data. But there is a point at least where the missing data is going to be covered by the preponderance of other data that's available to enable you to do a very valid dose reconstruction.

So if any missing data, one percent or two percent is going to persuade the Board that it is inadequate data, then you don't need to go through this process, right.

Chair Beach: What started this was a 40 percent, two out of five RWPs or a lack of people submitting was the problem. So I don't think we can answer that Jim until we get a look at that, at the RWPs and the data, which is where we started in what, five years ago. So I think we need to move forward with this and see where the facts are and make the judgment at that point.

Member Lockey: I agree with you Josie, but I think the judgment has to be made on just, more than just a percent of maybe one year and one data point just as 40 percent, and therefore they're missing 60 percent. It raises enough concern that the data is missing, especially when you have thousands and thousands of samples available that you can draw from to see well, if they are missing, where is it reflected? Where can we look at that to see it's reflected in the data?

Chair Beach: Hopefully, yes Jim. Hopefully we'll have that answer after SC&A has the chance to look at the data and the RWPs, and I think someone was trying to break in and speak?

Member Clawson: It was me Josie. It was Brad. One of the things I want Jim to remember on this, and this is one of the things we got into, because one of the processes and some of the things that were missing on this was termination bioassays. They were leaving without this, and this has been a problem

throughout the thing.

I understand what you're saying about the best science and everything else like that, and we always try to be able to go to this. But this is not just going out there and evaluating what somebody's dose possibly could have been or could have feasibly been here. This is also a compensation program. This isn't a science project. It really isn't.

(Simultaneous speaking.)

Member Lockey: I think we need to take that to the Board. This is a dose reconstruction program. This is a compensation program. When we do those dose reconstructions on individual Work Groups, it is to determine compensation in relationship to that person's total dose. So I agree with you on that. But there is a point we have to say the science is adequate enough to do a precise dose reconstruction on the people who were working at a facility. I mean there is --

Chair Beach: Well, and Jim I agree with you on that. When I started thinking about moving forward, we can take this to the Board and we can ask for an SEC for that time period in question. But the Board is going to ask us to do this work anyway I believe. So I feel like the question needs to be answered. It's not a new question, how complete is the complete data.

We don't know until we get a chance to look at it, so are you disagreeing with the path forward in having SC&A tasked to look at the two reports and the RWP data?

Member Lockey: No. I think if SC&A thinks they're qualified to do it, which I think they are. But I would like them to be much more precise than they were before, and come up with objective criteria of why they think the data is inadequate, okay? Not just a percentage, that they only sampled in Year 2000 40 percent, this one particular job tasks during this one particular period.

That doesn't cut it for me, especially when we have so much data available. It has to be something above that, okay.

Chair Beach: Okay, that's a fair enough question, I think. SC&A, you agree?

Mr. Barton: Well perhaps I'm misinterpreting Dr. Lockey's comments. I think in the end, a lot of times this comes down to a judgment call by the Board as to what constitutes a complete data set. So I absolutely understand that, a single data point where, you know, in 1999 it was a single RWP 40 percent.

Now obviously that doesn't speak to any sort of or it doesn't speak to the whole picture of completeness of your data set. But when you say like, you know, it shouldn't just come down to the percentages. I'm not sure what we're left with as far as objective criteria, in saying this is an acceptable level of completeness and this isn't.

And ultimately I think that that's really a judgment call for the Board. We can present the analysis in much the same way NIOSH does, and look at it perhaps from a few different angles, and present that to you all. But ultimately the -- at least as it currently is, how complete is complete is really a judgment call for the Board. What I think I'm hearing you say, Dr. Lockey, is that the Board should really establish what is acceptable.

However, you know, with every different site situation that does get murky as far as setting down ironclad guidelines as to what an acceptable level of completeness when you have a case that you're trying to use to construct doses to monitored workers.

Chair Beach: And if I'm not mistaken, that's the same thing that they do with the coworker models. They use the data to make the coworker models. So what's the percentage there as well? It's a judgment call for

the Board to make. It's the same.

Member Lockey: The data that's used, if it's an extensive database and they're reusing redundancies to look at the validity of the data, and there's a high correlation relationship to one database to the next database and the next database, and you're putting the limits at 95 or 99 percent, and you're looking at the highest potential exposures that occur at the facility, to me, that's a rather rigorous program.

And whether when we come out the other end it's validated remains to be seen, because NIOSH has gone forward and done that. But I would like SC&A to go through the same process that NIOSH goes through and say, yeah, we used what they did. We looked at the whole database. We looked at their approach, and their approach is a valid approach. It gives us confidence that we can do dose reconstruction, but there are some holes in it, and here are where the holes are and these are unknowns, because two percent of the workers in this job weren't monitored and 20 percent in this job weren't monitored during this year.

Then it's up to the Board to decide whether that's adequate or not. But I think as we move forward in time here, Josie, our databases become more and more rigorous and the exposures are less and less over time, and we do have to reach an approach where we can say that what represents an adequate database to do adequate dose reconstruction, all right, because we're never going to catch everybody at any one point in time. It's never going to happen. That's not the way it works.

Chair Beach: But that is also why we have SC&A, and they do -- looking at this data, I'm sure they will give us an objective view of what's available and the Board can then make a decision within our Work Group and then the full Board. So I think those are all good points, and I think SC&A will take those all to heart when they're doing their review and looking at the available data.

So it sounds like we're all in agreement to move forward. Any other comments or questions?

(No response.)

Chair Beach: NIOSH, I guess I'm going to ask, LaVon, can you give me a timeline of when you can have the data online available to SC&A, because that's going to -- I can't ask them for their deadline without knowing when you'll have that available to them.

Mr. Rutherford: I'll work to get that done as quickly as possible, and I also -- I'll give, I'll let SC&A know how long I do believe it will take. I will provide the email, because I did find it where I told you that we were including all of the RWPs in this, and I'll also include the email where I talk about the plutonium analysis.

Chair Beach: Okay.

Mr. Rutherford: I'll pass it on to the entire Work Group.

Chair Beach: Okay perfect, and then if you'll just pass on to the Work Group the timeline and then if -- or if Bob has any questions or has any need for anything else, if he can just shoot you and us an email so that this --

(Phone ringing.)

Member Lockey: This is Jim Lockey. I have to get back to my --

Chair Beach: Yeah. Jim, so thank you for joining us in this difficult time period for your family.

Member Lockey: I apologize for this. They're calling me back to the room.

Chair Beach: No. We appreciate you being able to be on. So thank you and we'll catch up with you later.

Member Lockey: Okay, bye-bye. Bye-bye everybody.

Member Clawson: Hey Josie, this communication with SC&A and with NIOSH, could you please -- you do very well to be able to forward us whatever you get, stuff like that. But when this is being sent out, could it go to the full Work Group so that we're all on the same page?

Chair Beach: Yeah. If it goes to Rashaun, I'm sure Rashaun can -- is better able to get it out to the full Work Group. If I see something that's not, I will forward it on to Rashaun to review, to send out.

Member Clawson: Right.

Chair Beach: Is that okay Rashaun?

Dr. Roberts: Yes, that's fine.

Chair Beach: Okay, okay. So if there's -- if there's anything else? Otherwise, I'll move that we close for now.

Member Clawson: I just want to make sure that SC&A is clear on what our tasking is, and if we need to clarify anything for them as it comes down the road, we need to make sure the whole Work Group is involved in making sure that we're going down the correct and best path. So Bob, is there -- at this time you may not have any, but is there any questions?

Mr. Barton: Well, I guess just to -- let me restate my understanding of what our tasking is, is that we look at Report 0101 and 0102 in very much the normal fashion we would, with sort of the add-on task of expanding past just the plutonium access list RWPs, to look at some of the other RWPs that required urinalysis with some of the other source terms. That's my understanding.

Member Clawson: Yeah. I'd also like to see if this is the -- I feel like it varied from what the Board exactly. I'd just like you to -- was this the best approach that they went? And that should, that shouldn't be much, but I'd just like to see that.

Mr. Barton: I understand. I'm certainly not necessarily in position to comment on it right now, but as we get into the data and look at some of the other RWPs, I think it will probably be fairly evident, and we'll strive to answer that question for you Brad.

Member Clawson: Okay, thank you so much.

Chair Beach: Okay, and Gen, anything else for you?

Member Roessler: Nothing here.

Chair Beach: Okay. LaVon, y'all?

Mr. Rutherford: Nothing from me.

Chair Beach: Okay, appreciate you guys. Thank you.

Dr. Roberts: Josie?

Chair Beach: Yes, go ahead Rashaun.

Dr. Roberts: There is an item on the agenda for petitioner comments.

Petitioner Comments

Chair Beach: Oh, I apologize. You're correct, yes. Thank you so much. It's buried under my stack of paperwork. So, yes, at this time, if we do have any petitioners -- I think Andrew was on the line. And if you're still with us, if you'd like to make any comments, that would be great.

Mr. Evaskovich: Yeah. This is Andrew Evaskovich. I appreciate the opportunity to talk. Getting ready for this, of course short hand, because I just received the reports on Friday and trying to come up to a response, I'll have to do it in writing as far as detail.

But I do have some comments. I'll bring up my sheet here. I want to go back to 835, because they only have that one report from 1999, and in 1989 LANL was subjected to the Clean Air Act, and they were sued for not being in compliance with it, and they still weren't in compliance with it even until after three

audits. I think those were completed in 2002.

So even though you say you're not relying on 835, the fact that they weren't in compliance on this other issue and there were quality assurance issues that came out of the Clean Air Act as far as usage of materials, and I think that plays a part as far as the monitoring that goes for workers.

An issue of the bioassay kits, we go back to that and I've brought it up before, is bioassay for different materials were done in different kits at least I know of. Plutonium is one kit and uranium is another kit. So capturing, you know, other radionuclides and you're obviously saying you don't have in vitro bioassay for the exotics again.

Now referring to the frisking and monitoring upon exit, there have been failures in the system as far as the equipment goes. I can speak specifically to the Sigma SM-66 and TA-3 with the americium incident. The individual that was involved, he hand-frisked himself and they know that he did because they found contamination on the equipment.

But the equipment failed to detect the contamination, and there have been incidents of individuals leaving areas and going home, and it was not discovered that they were contaminated until they returned back to work the following day. So saying that, you know, the program was rigorous in that aspect, I don't think it was. I managed to find a paper from the Health Physics Association concerning bioassay monitoring of mixtures of radionuclides.

Now the paper appears to be well, concerned with the primaries such as plutonium and americium, and they do mention neptunium. Some excerpts from it are this. A mixture is defined as a collection of radionuclide constituents that are present at the same time in the same process, such that intake of one of the constituents must necessarily coincide with an intake of all the other constituents.

To go further, because of the differences in uptake and biokinetic behavior for a given radionuclide in different physical and chemical forms, the dose delivered to a given person by a certain quantity of radionuclide is not always the same.

Even for known physical and chemical form, biokinetic models are often highly uncertain, leading to large uncertainty in the potential dose. For that reason, the quantity of a single radionuclide in process that leaves a substantial for a one millisievert CED to be established by using some standard method such as those laid out in NRC regulatory guides.

Monitoring thresholds for pure radionuclides used at Los Alamos National Laboratory have always been established. However, determining monitoring thresholds for radionuclide mixtures presents special challenges. It is not necessary for the potential dose of any single constituent to exceed one millisievert, in order for monitoring to be required under regulations.

However, in some cases it might neither be -- it might be neither feasible nor necessary to monitor for each constituent of a mixture.

And another excerpt, "Along the dose coefficient, the routine in vitro bioassay monitoring threshold, is a key characteristic of a mixture. In particular, monitoring thresholds must be calculated for the total mixture, as well as for the individual constituents. These calculations analogous to calculations of the dose coefficients." In determining monitoring thresholds, some assumptions must be made to estimate the fraction of material that could venture into the body.

And another except, "More often than not, employees work with a variety of mixtures, all with different ages and compositions. The combination of mixtures an employee is or might be working with can be characterized as a metamixture."

And another excerpt, "In practice, determining which constituents to monitor is a complicated decision involving a number of technical and practical considerations. These decisions must be made on a case-by-case basis, and may need to be revisited as considerations change, example when a new technical capability becomes available. Determining which constituents of the mixture should be directly monitored is a complicated decision.

And this part is from the Appendix of the article. "However, it is not always clear which nuclides must be monitored. For example, it may be that monitoring threshold for a mixture is exceeded without exceeding the monitoring threshold for any of its constituents." And this is from 2017, Healthphysics.com. I can forward it to you, but I think that, you know, goes back to the plutonium bioassay, because it does refer to different types of plutonium present, plus americium and neptunium.

And I bring this up again. There was a finding that the neptunium was not properly monitored for in the air and sampling when it was worked on at TA-55. I haven't been able to find the article, but I also believe it was worked at, worked on, that project was worked on at CMR before going to TA-55.

As to the exotics and their locations, you've excluded TA-54, which has all types of materials in there. TA-2 was the reactor, and that was in the process of decommissioning. I believe they completed that before I started to work there in '98. But it did go into this time frame, and there were mixed fission and activation products that were present there during the decommissioning.

Another area that was decommissioned was TA-21 DP site, and that wasn't completed I think until the 2000's. They were finding a lot of components in there, and we were staffing in there, providing security as far as during the decommissioning plus before that, because there were stations in there that were operating until I believe 2000, that we staffed

and there were people working in there, even though it was decommissioned.

So there is the potential for exposure there as we were doing that work. So I'd just like to point that out. I think there are deficiencies as far as what's being addressed in 0101 and 0102, and I'll try to come up with a written argument here in the next few weeks, because I have a lot of research that I have to do.

I have to go back through a lot of my material, which you know is quite extensive, to find the items that I'm looking for that, you know, concern the basis of my argument. And that would be all I have to say today. I thank you for the opportunity and I thank you for this meeting.

Chair Beach: Thank you, Andrew, and thank you for your written comments. And, yes, if you can get them to Rashaun, then she'll distribute them to all of us, the ones today and then anything additional you want to add.

Mr. Evaskovich: Okay.

Work Group Discussion & Path Forward

Chair Beach: That's always helpful. Thank you very much. Okay. Let me look at that agenda. I think that brings us to a close, unless there's anything I think path forward. I don't believe we will need to have a presentation other than just a regular update at the April meeting, unless you think something different is needed Rashaun.

Dr. Roberts: No, an update during the Board work session I'm assuming.

Chair Beach: Yeah, yes.

Dr. Roberts: That should be fine, uh-huh.

Chair Beach: Other Board Members, questions, comments? Are we okay to close?

Member Clawson: This is Brad. I'm good to close.

Chair Beach: Okay, I believe Gen said earlier she was --

Member Roessler: Yeah, I'm good.

Adjourn

Chair Beach: Okay. It's good to see everybody, and thank you for all your comments and thoughts on this one.

Member Clawson: Okay. We'll see you guys later. Have a marvelous day.

Chair Beach: Yep, bye.

Dr. Roberts: Bye.

(Whereupon, the above-entitled matter went off the record at 1:42 p.m.)