UNITED STATES OF AMERICA
DEPARTMENT OF HEALTH AND HUMAN SERVICES
CENTERS FOR DISEASE CONTROL AND PREVENTION

+ + + + +

NATIONAL INSTITUTE FOR OCCUPATIONAL
SAFETY AND HEALTH
ADVISORY BOARD ON RADIATION AND
WORKER HEALTH

+ + + + +

WORK GROUP ON MOUND

+ + + + +

MEETING

+ + + + +

THURSDAY, MAY 28, 2009

+ + + + +

The Work Group convened at 9:30 a.m., in the Zurich Room of the Cincinnati Airport Marriott Hotel, Josie M. Beach, Work Group Chair, presiding.

MEMBERS PRESENT:

JOSIE BEACH, Chair
BRAD CLAWSON
PHILLIP SCHOFIELD
PAUL L. ZIEMER*

MEMBERS ABSENT:

ROBERT PRESLEY

ALSO PRESENT:

THEODORE M. KATZ, Acting Designated Federal Official

BOB BISTLINE, SC&A
ELIZABETH BRACKETT*, ORAU Team
RON BUCHANAN, SC&A
MELTON CHEW, ORAU Team
LARRY ELLIOTT, NIOSH
LEO FAUST*, ORAU Team
JOE FITZGERALD, SC&A
EMILY HOWELL, HHS
KARIN JESSEN, ORAU Team
TOM LaBONE*, ORAU Team
JOYCE LIPSZTEIN*, SC&A
ROBERT MORRIS, ORAU Team
JAMES NETON*, NIOSH
GENE POTTER, ORAU Team
BRYCE RICH*, ORAU Team
KATHY ROBERTSON-DeMERS, SC&A
MUTTY SHARFI, ORAU Team
DON STEWART, ORAU Team
BRANT ULSH, NIOSH

*Present via teleconference.

TABLE OF CONTENTS

P-R-O-C-E-E-D-I-N-G-S

9:33 a.m.

MR. KATZ: Good morning, everyone in the room and on the line. This is Ted Katz. I am the acting designated federal official for the Advisory Board of Radiation Worker Health. And this is the second of the two-day meeting of the Mound Working Group. And we are ready to begin.

And we will begin with roll call, starting with Board members in the room. Please, everyone who responds to the roll call except people in the public, of course, speak to your conflict of interest as well status. Thanks.

Beginning in the room?

CHAIR BEACH: Josie Beach, Working Group Chair. No conflicts.

MEMBER CLAWSON: Brad Clawson, Working Group Member. No conflict.

MEMBER SCHOFIELD: Phillip Schofield, Working Group Member. No conflict.

MR. KATZ: And on the line? Do we have any Board members on the line?

MEMBER ZIEMER: Paul Ziemer. No conflicts.

MR. KATZ: Welcome, Paul.

Okay. And then in the room, the NIOSH ORAU team?

MR. ELLIOTT: Larry Elliott, Director of the Office of Compensation Analysis and Support. No conflict.

MS. JESSEN: Karin Jessen, ORAU team. No conflicts.

MR. CHEW: Mel Chew, ORAU team. No conflict.

MR. MORRIS: Robert Morris, ORAU team. No conflict.

MR. STEWART: Don Stewart, ORAU team. No conflict.

MR. SHARFI: Mutty Sharfi, ORAU team, conflicted.

DR. ULSH: Brant Ulsh from NIOSH. No conflict.

MR. KATZ: On the line, NIOSH/ORAU team?

DR. NETON: This is Jim Neton, NIOSH. No conflicts.

MS. BRACKETT: Elizabeth Brackett, ORAU team. I do have a conflict.

MR. KATZ: This is Bryce Rich, ORAU team. I'm conflicted.

MR. FAUST: Leo Faust, ORAU team. No conflicts.

MR. KATZ: Any more NIOSH or ORAU team on the line?

MR. LaBONE: Yes, yes. This is Tom LaBone. I am conflicted.

MR. KATZ: Okay. And then so that takes care -- now, HHS or other federal officials or contract staff in the room?

MS. HOWELL: Emily Howell, HHS. No conflicts.

MR. KATZ: And on the line? Any federal officials or contract staff?

(No response.)

MR. KATZ: Okay. And then members of the public? Oh, no. SC&A in the room?

MR. FITZGERALD: Yes. Joe Fitzgerald, SC&A. No conflict.

MR. BUCHANAN: Ron Buchanan, SC&A. No conflict.

DR. BISTLINE: Bob Bistline, SC&A. No conflict.

MS. ROBERTSON-DeMERS: Kathy Robertson-DeMers, SC&A. Conflicted.

MR. KATZ: And SC&A on the line? Any members of SC&A on the line?

(No response.)

MR. KATZ: Okay. And then any members of the public who want to identify themselves on the line or staff of congressional offices?

(No response.)

MR. KATZ: Okay. Then just let me remind everyone on the line to please keep your phones on mute except when you're speaking to the group here. And if you don't

have a mute button, *6 will work. And to take yourself off mute, just hit *6 again.

Thank you. Josie?

CHAIR BEACH: Okay. Good morning. And welcome to Mound's fourth Working Group meeting, second day. We are going to start with neutron dose reconstruction issues number 14 and 15. And NIOSH is going to kick this off this morning. And I'll turn it to Brant.

DR. ULSH: Okay. Thanks.

Just to let you know what is coming, I have asked Bob Morris to give a PowerPoint presentation. He first gave this presentation at a worker outreach meeting that we held in the first week of April.

Basically kind of the history of the neutron issue, it probably goes back even earlier than I am about to say, but some of the former workers that we have been consulting and dealing with discussing the Mound issues with right from the early days of the SEC petition brought up the way that

neutron doses were handled in the Mound TBD and brought up some issues that they thought we might want to consider on that. So we have been looking at it at least since then.

And, finally, we decided to -- I asked Bob and his team to take a look at the neutron, the way we did it in the TBD and to come up with some improvements. We discussed a lot of issues in the context of this SEC Working Group as well.

We have come up with a revised approach. It is going to be kind of a hybrid approach depending on the data that we have available for different time periods. Bob presented this. He gave his PowerPoint presentation at the meeting that we had with the workers in the first week of April.

The purpose of that meeting was basically to lay out our new approach and to solicit any comments or thoughts or insights from these about 20 or so workers.

These workers were chosen not

really by need but by some of the former workers who have expertise in neutron dosimetry.

They included health physicists in charge of the SM building and PP building, T building, also just a variety of workers, including even the two ladies who actually sat down and read the NTA films. So we really tried to get a broad cross-section.

So we gave that presentation. It was very well-received. They made a few comments and suggestions that we might want to consider. And I know Bob was in the process of considering them.

The next development that occurred on the neutron issue, we issued a white paper. SC&A has looked at that, and we had a conference call with SC&A on April 28th. Ron Buchanan offered a few comments that we thought were very productive. So we are in the process of taking a look at those as well.

So this will just give you kind of

a snapshot of where we are with this issue. And, with that, I will turn it over to Bob.

MR. MORRIS: Thank you. I appreciate your moving the schedule to accommodate my --

CHAIR BEACH: No problem.

MR. MORRIS: -- sixth grader's commencement into seventh grade. So it is important.

So I want to introduce the colleagues who helped me with this. I think both are on the telephone line. At least I think Leo is. Leo Faust is a key person in doing the research on this topic and Billy Smith. Billy, have you joined us yet?

(No response.)

MR. MORRIS: Billy Smith is a coauthor on this also.

DR. ULSH: If I could interrupt you for just a second? We're going to turn down the lights.

MR. MORRIS: And, just for

background, Billy ran the NTS dosimetry program for many years, external *9:41:52 program, actually kicked off the use of their first TLD system at NTS. So he's got a broad background in that. And Leo has got a long resume in dosimetry.

Next slide, please. I wanted to give a little bit of background. As Brant mentioned, we have presented this similar presentation to a group of Mound workers in April. That was actually very well-received. And they appreciated the presentation.

You didn't mention that there actually were technicians who had made some of the measurements beyond reading the NTA forms but also actually carried the meters into the field to make some of the measurements that we used to consider the neutron/photon ratio data.

Also, there was a gentleman there who had made many of the original neutron spectra measurements that are available for us

in published literature. And so he actually was a pioneer in the development of neutron spectra measurements and was there and provided some very constructive criticism to us in our presentation.

We have had the benefit of SC&A having reviewed our white paper at this point and got very constructive comments. We are in the process of updating those and incorporating them.

The issues fundamentally are limited to the era prior to use of TLD dosimetry technology. And so that is what most of this focused on. That is not to say that we don't have a method for the TLD. You know, it's the same as defined in our technical basis document.

The doses are designed as we have reconstructed them here, to be claimant-favorable and accurate enough to make an appropriate compensation decision. But we don't want to represent that these are

perfectly accurate numbers. When there are uncertainties, we have moved the choice of correction factors to the high side.

Neutron dose estimation is necessary for our compensation decision. Not all workers were monitored for neutron dose, especially in the earliest years of the operations. And so dose must be inferred from other information.

This goes to a problem that we have seen on many other sites, use of NTA film. NTA stands for neutron type-A film, generally from Kodak in the early days. But it's generally that acronym has superseded the definition. NTA is how we would think of this kind of technology.

It was a highly resolved grain film. And in order to read it as a neutron event, there would have to be a sequence of grains that actually developed in the development process. We see them as a track at least three grains long. In some cases

more grains would be in a row.

And those would be easier to spot as a track. That is what the people who look through the microscopes are there, to read neutron tracks, were doing this. They were taking a tiny field on a film and then blowing it up into a visible size and counting with a scoring device, like an umpire might use, the number of tracks that were in that area.

And so it to some extent was subjective in that you just had to say, "Oh, I recognize these three grains or more in a row that is being tracked." And once it is recognized, then you can actually tally it.

As you can imagine, people get better with that technology as they continue to do it. And so that is why you see very little turnover in these groups of people that tend to read the films. And they would be the same people that read the calibration films would also be reading the actual exposure films that would monitor the workers.

One of the frailties of the NTA system is that it takes a certain amount of energy to create three grains developed on the form in a row. And that is effectively the threshold of detection of the neutron detector for this system.

So it's widely accepted that at about half a MeV, a neutron with an energy carrying more than .5 MeV, mega-electron volts, is capable of creating that three-track in a row pattern. Some people say it's a little lower. Some people say it's a little higher. But for a rule of thumb, we assume -- and this is part of our OCAS literature that's been approved.

We assume that the film is responsive to the neutrons that carry more than half an MeV of energy. And, for practical purposes, although there is an exception here of a pure thermal neutron field, for practical purposes, we assume that the dosimeter, the NTA dosimeter, is not

responsive to neutrons that occur less than a half an MeV.

So we have got this problem of if the exposure was predominantly on the lower energy side of the neutron spectrum, then there is a larger correction that has to be made for the lack of registry that was made.

Another problem with NTA film is that it is not as sensitive as our modern techniques that we have become accustomed to with CR-39 and the TLD methods.

So there was some potential for misdose on every readout cycle, then. This wouldn't have been registered as a different than background fogging on the film. So those are the kinds of things that we have got to deal with in dealing with NTA as a dosimetry device.

Unmonitored workers or workers with a zero in the readout cycle present interpretations, problems for how to interpret the data or lack of data and then infer it

into a dose calculation. Unmonitored workers are assigned a dose similar to the monitored workers in the same period. That's the very familiar coworker model that you guys have seen.

Now, the question is, where do we get the data for the coworker model? And how do we put it into a distribution? And what are the values that we choose for that? That is the kind of detail that gets resolved with SC&A's help.

The other kind of problem we get when we are interesting this is the people who actually wore a dosimeter, wore an NTA film dosimeter. But then their dose is recorded as zero by the person who read the film.

In fact, as I mentioned, there is a sensitivity cutoff on this. So the dose may not really be zero but some fraction of the detection limit. In fact, it's possible the dose really is zero, but we can't prove that one way or another.

So, the very familiar methods that have been developed at other sites and with a lot of precedent to correct the misdose problem get applied.

So when we address this misdose concept, it is generally a sign that is one-half of the reporting limit. So if, for example, if the reporting limit for a two-week NTA readout cycle is 50-millirem, then each monitored worker had a zero recorded on their dosimeter would be a sign of half of that reporting limit. And for that two-week cycle then would be given in our dose reconstruction method 25-millirem, when the record, the dose of record, was actually zero.

So there are ways to infer neutron dose to help monitor the workers. We can use, as I said before, coworker model or we can choose to use a concept of the neutron to photon dose ratio.

We have seen the neutron/photon ratio used in other places. I think it's in

conversation right now at Hanford and other sites.

So the concept here is that the workers wore photon dosimeters, a film badge that was capable of measuring X-rays or gamma rays.

And when we take that number, if we can find a consistent ratio between neutron exposure and gamma ray or photon exposure in the facility, then we can take that number and multiply it by the ratio and get some kind of proportionality so that if you had -- let's say we would hope to find a ratio of perhaps two millirem of neutron for every one millirem of photon dose you would get and then we knew that the worker wore a photon dosimeter that measured 100, we would then assign 200 millirem for neutrons that would be added in as external dose. So we approached that problem.

There are two sources of data that could be useful for establishing that neutron

to photon ratio. We could potentially get it from paired instrument measurements, where a monitor would have taken a radiation detector capable of measuring neutrons into the field, making a dose rate measurement and then at the same location and coincidentally in time making a gamma ray measurement. So we looked at a lot of data that would have potentially given us that information.

The other approach to getting neutron to photon ratios is to take actual data sets from fully monitored workers, those people who wore neutron NTA film and wore their gamma ray badge, gamma ray dosimeter, and see if we can come up with a ratio between those two things.

So, again, this harkens back to the outreach meeting we had, where we actually go into some explanation of what the coworker model is. And at risk of boring you, I will go through that quickly because you folks all know that, I think.

The dose data from all monitored workers is corrected for misdose in the coworker model. And then the other factors, the correction factors, are applied. And then the data are grouped by time.

So it depends on how much data you've got. It could be annualized or you might choose a two-year time cycle or a quarterly time cycle. Really, it depends on how strong the data set is.

The data are fit to a log-normal distribution. There is an assumption that there is a log-normal distribution underlying all this. Fiftieth and 95th percentiles of the distribution are determined.

And then a value can be assigned to the unmonitored worker from that coworker model. Most workers are getting the 50th percentile value while some workers with high exposure potential are assigned to the 95th percentile.

Now, in all cases since OTIB-0052,

the construction worker dose considerations technical information bulletin was published a couple of years ago. We now have a 1.4 multiplier on external dose for unmonitored construction workers when a coworker model is applied.

So we take 140 percent of whatever those values, the 50th or 95th percentile, would be if your job description defines you as a construction trade worker; for example, pipe-fitters. A lot of maintenance people fall into this category. It's not just new construction-type work or retrofit construction. So it's a pretty broad brush that we define construction workers with.

So the point about this in this bullet is the construction workers get a 40 percent premium of dose assigned to them under this assumption.

Now, why would we assume a log-normal distribution in the coworker model? In some levels, it becomes an article of

faith. The data fit something. And over and over again, we have found that log-normal distribution tends to be a very good one. It's got a few characteristics that make it appropriate.

We know that many environmental exposures are well-described by it. The model is constrained so that the number can never go below zero. And it allows for a relatively large portion of the values to be biased to the low side, at the same time accommodating a small fraction of outliers as a normal expectation. So a number of higher exposures do occur. It turns out that this has been a pretty successful assumption set that we just begin with.

Now I want to look at the paired instrument data that we had access to. As I mentioned earlier, a neutron rem-meter and a gamma ion chamber, dose rate measurements were taken at the same location.

This was a practice that continued

over and over at Mound for many years. And the monitor would take these instruments to specific places, make the pair of instruments, and write down the record.

We found approximately 46,000 pairs of instrument data from the R, T, SM, and PP facilities. A sample, which I have to admit is a really remarkably large sample, of that 46,000 was actually entered into a spreadsheet, X/Y pairs.

And we then sorted that data, hoping to find some statistical significance in the numbers and more or less arbitrarily but based on our occupational experience in controlling and measuring radiation fields, especially neutron fields.

We set an arbitrary threshold to look at data that was only in excess of two and a half millirem per hour for both kinds of measurements.

The reasoning behind that is that when you look at the number of counts per

minute per millirem per hour that have to be registered in a neutron meter in order to get a millirem of dose, you find that statistical significance is pretty high for the numbers below a couple or three millirem per hour.

And so we chose to censor our data set that way in order to hopefully not get bogged down with the statistical fluctuations of the lower doses. That resulted with 5,162 paired measurements that were in excess of two and a half millirem per hour.

And this is kind of what our data set looked like. If you look, notice that it is a logarithmic scale on both the x and the y-axis. And notice that it is essentially a shotgun pattern that goes from high to low, no obvious -- I actually told the joke at one point that, of course, we fed a straight line through this data set and it matches perfectly, which, of course, isn't true.

It's hard to find a strong correlation in any degree at all. We actually

did the statistical correlation tests on these data. And they approach zero correlation.

So that hope that we had had of finding this ratio of neutron to photon dose rates that could then be applied to the measured photon numbers seems to have fallen on fallow ground here.

We don't see a real pattern. It may be possible that we could look at this again, try to separate it out more by year, and potentially separate it out more by facility, but the big picture is we just didn't find anything that gave us a clue that there was going to be a strong correlation, strong enough that we could make an argument on top of it.

Now I want to talk about our NTA film. We had a good set of data, very well-documented program on NTA film. There was a lot of history about what was done, when it was done, when changes occurred, how calibrations were made. And this comes from

an extensive 2,000-page document of the history of the external dosimetry program.

So it turns out that in my estimation, that people who were in charge of that program or the dosimetry program at Mound were chronic note keepers, and they just wrote a lot of information about what they did.

So we were able to find a lot of original source material that was contemporaneous and provided you a reason to believe that this is how they ran their program.

As I mentioned before, we needed to correct for neutron energy response less than .5 mega- electron volt energies. We needed to consider the calibration source that was used in the test irradiations of the time. The calibration source changed over time.

We also needed to consider the geometric factors. The calibration of the NTA film was done in a perpendicular plane to the beam coming out of the neutron source.

But unless you are exclusively a glove box worker, which, you know, a lot of people are glove box workers, but, then, there are other people who are not.

You are actually more oftentimes in a rotational geometry, not just that interior/posterior geometry. So we considered to some extent correction factors for rotating geometry in the workplace.

And then another factor I didn't mention in my preliminary conversation was this idea of track fading. As I said before, it takes three grades in a row to score a track.

But after those are developed, they actually have a tendency to fade with time. And so depending on when you read the film after it is developed, you might get a different answer depending on whether you read promptly or if you read more later.

So there is this well-established problem called track fading. And track fading

was considered contemporaneously. And we needed to make sure that the appropriate factors were applied for track fading.

We started with a lot of information. Neutron spectra are available from a lot of sources. The graph you see here on the screen was actually published in peer-reviewed literature. The measurement was made by a Mound scientist at Mound. And the date on this is 1967. This is pretty early for making these kinds of measurements.

Now, you can find exactly the same spectra in modern published literature. You can actually run a program that will from first principles calculate what this kind of spectrum would look like.

If you say, "I've got a plutonium oxide source" or "I've got a plutonium beryllium source," there are programs available that will effectively calculate this and print it out.

What we find is that there is a

very self-consistent and pre-extensive number of neutron spectra measured at Mound in the facility. If you notice, the low-energy component is not registered below a half MeV on that graph. And that's because in 1967, the way you measured neutron spectra only had one data point down at the thermal range. It was missing some data points between the lowest energy and the half MeV numbers.

So that's what the more modern publications of neutron spectra can give to us, is that missing information in that low-energy data. Nevertheless, we had neutron spectra to start with from many different sources. And they all seem to be self-consistent.

One of the problems, then, about getting to the point of how much of the information would be missed by the threshold effect of energy is figuring out how much dose-equivalent is delivered by neutron in specific energy.

The NCRP in publication 38 many years ago, more than 25 years ago, published this graph, which is a neutron flux to dose-equivalent rate conversion factor. This is data for neutrons.

The interesting thing about this graph you'll see is that the numbers don't really matter that much except the shape of the curve matters. You will see that below one MeV the amount of dose that any individual neutron delivers falls off precipitously, and above one MeV, it's more or less a straight horizontal line.

So high-energy neutrons carry in that context energies above one MeV, carry more or less the same dose per neutron while lower-energy neutrons, the ones that the NTA film doesn't see very well, really don't carry much individual dose per interaction. So that's in the favor of the dosimeter there.

So even if you are missing some dose, it's missing registering some of the

neutrons that hit the film. The dose per neutron that hits the film is relatively low.

Okay. Go ahead, please. And so this is one slide that summarizes a lot of work, essentially. It just gives you a snapshot of what we did.

We used the computer program called MCNP. It's a program that is widely used in nuclear science fields. And it is currently supported at Los Alamos.

I understand the last time I heard there were more than 500 Ph.D. years invested in the development of MCNP. It's highly reliable now if you model the geometry correctly and apply and use the right data libraries.

So what we did is we started with that neutron spectrum that I described to you earlier. And we put that in as the input energies for the neutrons. The Monte Carlo code, then, MCNP, that's what's called a random walk. And it lets a neutron start at

this location, move through space, and randomly interact with some molecule or some atom that's in its path.

It randomly then scatters according to the cross-sections. And say the probability of a neutron getting this way and then scattering this way is X. It does this for thousands and thousands and thousands of interactions until the uncertainty of the number of neutrons crossing a plane in space as you set the problem up becomes very small. I think we stop this problem at about one percent uncertainty.

So effectively what you see now is I have expanded this scale down, this logarithmic scale, on the x-axis. And we applied the NCRP weighting factor. And you can see that almost none of the dose below 100, or .1 MeV, is available. It's all up under -- the area under the curve is, proportional to the dose from the spectrum.

So if you integrate the area under

the curve from 0 to 500 KeV or .5 MeV and you integrate the area under the curve from .5 MeV to the top of the curve, you get effectively a ratio of measurable dose to unmeasurable dose by the NTA film.

We did this for several different scenarios with several different materials to start with, plutonium oxide -- I have to go back to my chart here to figure it out.

Yes. You can go to the next one. And we did it for plutonium fluoride, plutonium oxide, and polonium beryllium. We did it with various thicknesses of water shielding surrounding the source.

And we find that the thicker the water shield, the slower the neutrons are, the lower-energy they are. And so the more misdose you have.

Now, it is interesting to see how this graph works is that for unshielded neutron sources, we potentially miss 15 to 25 percent of the dose with the NTA film.

So you could say if you knew you had an unshielded source and you were missing 25 percent of the dose, you could take the measured dose and divide it by that value and actually come to a reasonable correction factor.

The challenge then becomes picking the scenario to model with. And it is some place between zero and where we think of being 16 centimeters, which is 15 centimeters is 6 inches of water.

So at some point in here it is a reasonable scenario for how much dose was not detectable using the NTA film, what fraction of the dosimetry results should be corrected.

We also looked at the Benelex shielding and found that it had no effective difference compared to water, as you would expect. And the point of all of this is now one can select a value and from that develop a correction factor, making the NTA film useful as a measurement device that can be

effectively used to make dose reconstruction measurements.

So the NTA data needs to be corrected and the misdoses then applied. Now, there is this database called MESH, which is where all of the external dosimetry data was rolled up into. And, unfortunately, we had a problem with using it because it was rolled up on an annualized basis.

We don't have the raw data back on the two-week cycle with readouts. So we end up with lots of misdose driving this problem.

If you assign to people who actually got zero dose every two weeks, if you assign them 25 millirem, you are going to see that once you do that 26 times a year, all of a sudden, that has turned into a pretty big number.

So our MESH, our neutron data as it's reported in MESH, tends to bound the problem that certainly appears to overestimate the actuals that we can see by any other

indication.

So we'll go through the next one. We took the NTA data that was reported in MESH. And we applied a set of correction factors. This is just a few years out of a long table that is in our report. And some of these factors are changing based on some of the comments that SC&A has provided to us.

The bottom line is that we think that we are able to take the data in MESH, apply correction factors to it, and come up with a bounding value for the data as it is tabulated in MESH.

In some cases we found reports in this journal of the dosimetry work over the years that said, "We recommend that dosimeters, the data of record from NTA film between 1970 and 1977 be multiplied by a factor of 2 retrospectively to create the dose of record." So that is not showing there, but in the years 1970 to '77, that value would have been a factor of 2.

We tried to back that out so that arbitrarily applied correction factors could be removed. And then we could go in and individually apply the correction factors that account for energy threshold, for calibration mismatch, for track fading, for angular response. And so we could systematically look at each one of these corrections.

The bottom line as you look at many of these is that when you tally up all the correction factors and apply them, it turns out that the correction factor in general sums up to be about 1.8 or 2 or a little bit more than 2 in some cases.

But the reality is that we think we could take the MESH data and multiply it by the type of correction factor and come up with a reasonable number that way.

We did try to look at this data set, then, after we applied the correction factors and found that they varied widely by year. So this is taking the people that had

neutron data of record and photon data of record and getting the ratio of this too on an annualized basis.

And you'll see that those ratios range from close to zero up to 25. And that they tend to be in the few, the three to seven range of neutron to photon ratios, based on the MESH data.

But, as I said earlier, the MESH data is probably driven by misdose in most cases. Since we don't have the cycle-by-cycle readout, it is hard for us to understand that exactly. All we can do is say it is obviously boundable by this kind of approach.

Let's go to the next one. And I'll show you how it changed by year. We actually looked at these neutron-photon ratios from MESH by year.

And these probably represent some changes in processes, changes in materials, changes in facilities that were going on. The big picture is that there are ratios that can

be developed by these methods.

So our opinion at this point is that using these ratios from the MESH data, although they can be bounding, they tend to be overestimating to the point that we are not very comfortable with that.

And so we have looked for another approach for years where there was other data available. So it turns out that in the earlier days of the program at Mound, there were NTA data reported in the monthly or quarterly health physics progress reports. These were written routinely and with the same format month after month. Same topics were covered. And some changes are obviously trackable.

If you look in there near the bottom of that screen, you will see that the neutron, number of neutron films processed in this example period, -- this was a quarterly period -- the films were worn over a two-week period. And in the quarter, they processed

818 NTA films. Seven hundred ninety-eight of those read less than 100 millirem.

Now, this is contemporaneous. The correction factors that we have discussed were not applied. But, nevertheless, the people who were counting the grades in a row came to the conclusion that only 20 out of the 818 films that they saw had doses recorded on them in excess of 100 millirem.

So what that really does tell us is that most of the doses were substantially low, even after correction factors were made. It's possible to take this data and actually force-fed into a log-normal distribution.

And, you know, granted, we don't have the kind of number resolution that you would get from real number data. In this case we've got what you might describe more as categorical data as bin data, this low bin, this middle bin, and this high bin.

But, nevertheless, that is still a lot of information. Seven hundred

ninety-eight out of 818 were below this threshold of dose.

And so when you take that kind of information, it's possible to fit it with a significant uncertainty. When you do that, it's possible then to -- one more slide, please -- calculate the geometric mean of standard deviation and actually come up with that 50th and 95th percentile number value after corrections and misdoses are applied.

And you'll see just by a quick look of this monthly data from 1951 and '52 that the numbers are going to be about 400 or 200 depending on the time changed and the practices of calibration change.

So we can come up with a 95th percentile dose for these 10 or so years, 10 or 12 years, that we've got quarterly report data for.

So the big picture is this is our approach. We've got, as Brad said, to start with, a hybrid model. Some periods we've got

more refined data. Some periods we've got data out of the MESH database. And in some cases we've got real data for real individuals from the NTA film.

So we will apply some combination of that. And I think that we can make a case at this point that we bound in dose for a neutron. (***PART 2, 10:22:06***)

CHAIR BEACH: Thanks, Bob.

MR. MORRIS: You're welcome.

CHAIR BEACH: Are there any questions? I'm sure SC&A wants to respond, but any questions before of the slides or Bob's presentation?

MEMBER ZIEMER: Josie, Ziemer here.

CHAIR BEACH: Yes. Hi, Paul.

MEMBER ZIEMER: First let me thank Bob for the presentation. It was very, very well-done. Can you e-mail me a copy of the PowerPoint?

CHAIR BEACH: Yes. I am having one downloaded to my Flash drive right now.

MEMBER ZIEMER: I am looking at the paper itself. I think the shotgun pattern is probably not so surprising for the field measurements. You have got all kinds of scattering situations, which are very different in every field measurement.

So I like the approach that you used here: use the NTA film and do the correlation. And I think that's a good approach. I assume on the field measurements, many of these neutron instruments are also gamma-sensitive.

So unless they're correcting for the gamma or they have set the sensitivity setting high, you actually get neutron plus gamma to compare. You have to correct that back out. I assume they have done that. Is that correct?

MR. MORRIS: Well, Paul, thank you for the comment. We didn't try to do anything as subtle as finding out what the interference --

MEMBER ZIEMER: Yes. It probably wouldn't have made much difference on that.

MR. MORRIS: Right. I think probably what drives our large differences, as much as anything, is the actual radiation protection practices that were applied after the measurements were taken.

If you think about how you would shield with a lead blanket, for example, --

MEMBER ZIEMER: Right.

MR. MORRIS: -- you can drastically alter the photon --

MEMBER ZIEMER: Right.

MR. MORRIS: -- to neutron ratio with a --

MEMBER ZIEMER: Once you get the reading, you go ahead and make some changes.

MR. MORRIS: That's right.

MEMBER ZIEMER: Yes. And so the reality is that we probably did see those kinds of ranges of photon to neutron doses all over the facility just because some places

were easily shielded, some places were not.

MEMBER ZIEMER: Thank you.

CHAIR BEACH: Thanks, Paul.

Did you have --

MEMBER CLAWSON: I was wondering. This construction coworker that you were talking about --

MR. MORRIS: Yes.

MEMBER CLAWSON: -- explain that a little bit to me.

MR. MORRIS: Sure. I'll be glad to unless you would like to, Mel. Why don't you go ahead and do that.

MR. CHEW: Okay.

MR. MORRIS: I've been talking about --

MR. CHEW: What was the question?

MEMBER CLAWSON: Well, I got this 140 times the coworker dose for the construction workers.

MR. CHEW: Yes, sure. Yes. Let's go back to OTIB-0052. I'm glad you asked the

question. Remember when we did OTIB-0052, the key was, how do you apply an exposure to a construction worker that apparently either the data was missing or should have been monitored if it was not monitored.

So that is the focus. It was not the person who was monitored. You are a construction worker who is monitored. You took your actual information.

So we went across the complex, as you probably already all know, and looked at many, many data of people who were monitored and tried to compare that to exposures of construction workers who were monitored.

And so now you can think of this because Idaho was a good example, Savannah River was a good example, the big sites here, where a lot of construction went on, Hanford, example, Y-12, Oak Ridge.

So you do a coworker model of the full people that were monitored. You can see at some point in time almost everyone was

monitored. They first started monitoring some people. Then the monitored everyone, you know, how the things change.

And so we look at it. Secretaries are monitored. Clerical workers are monitored because it came along with their badge. So you can see how a coworker study could be skewed a little bit on the lower end here, especially if you had a construction worker who actually went into a process area.

Example, if he was not monitored, which is highly unusual, but anyway he wasn't monitored, his exposure could have been higher than the average or the 50th percentile, the 90th percentile, how you are going to look at, of everyone who was monitored. You can see where that is going.

So that is why when we looked at all of the data, the majority of the sties here are construction workers. If we pulled it out of even everyone who was monitored, you can tell generally they were even lower than

even the coworkers studied.

However, in a few incidences, you know, we can point them out. In certain years, they were higher. Example, Savannah River was the one that kind of jumped out at us. And we talked a lot about that in discussions here.

The pipe-fitters went in. And the people who drilled the holes into the concrete and things like this got higher exposures than you would have applied to everyone who was monitored this time.

So that's why when we sat back and looked at it, it appeared that it was much easier to just go ahead and apply a correction factor.

We looked at all of the factors of the people who were monitored for the construction worker, as compared to the whole set. And it showed that there were higher exposures for those particular constructions for those few years. And we determined that

the correction factor of 1.4 should be applied to the construction worker.

Don't forget this is applied to the people who were not monitored or should have been monitored and for who, let's say, information was missing. So that's where the correction factor came in. So it basically helps that we can apply that to just the construction workers over and be doing the coworker for that entire site.

MR. MORRIS: So it becomes a complex-wide policy decision-level correction that applies to any coworker model on any site if you were a construction trade worker.

MR. CHEW: Does that help, Brad? Do you need more detail?

MEMBER CLAWSON: No. It does. I'm just thinking about the worker that was there that was dealing with this on and off all through the thing. All of a sudden a construction worker comes in that is getting 1.4 more than what he does. He's actually

working for it.

MR. CHEW: Well, looking at that, if a worker was in there, most likely he would have been monitored.

MEMBER CLAWSON: Yes.

MR. CHEW: Okay. So you would have used his actual data, right? The coworker study really is to try to give some assessment to people who should have been monitored who were not monitored or, for some reason, the information was not there.

MEMBER CLAWSON: Okay. You said that you found in this data -- and this is probably from Mound or whatever -- that for ten years there, they timesed everything by two?

MR. MORRIS: There was a memo that we found that instructed that data to be multiplied by a factor of two. Retrospectively, they took the database and increased the number of the dose of record.

MEMBER CLAWSON: For the whole

everybody?

MR. MORRIS: All neutron. It was NTA neutron numbers.

MEMBER CLAWSON: Right.

MR. STEWART: And that was actually only for the PP building. What they found was their neutron calibration was slightly underestimating dose to the PP building, so large amounts of shielding there. So they retroactively realized it's just simpler to run a factor of two for those workers in the PP building.

MEMBER CLAWSON: Okay. Because what I got out of this is that you guys basically took that times two off, right, to bring it back to normal to everybody else?

MR. MORRIS: And then we reapplied it as a specific factor that we could actually account for, instead of being, let's just multiply everything by two.

Our factor comes out very close to two at the end, but now we know why it does.

You can pull out each factor.

DR. ULSH: So it's actually kind of reassuring that at the time that they were proposing to do this, what was it, early '70s?

MR. MORRIS: '77.

MR. STEWART: When the memo came out.

DR. ULSH: We've got all these issues, and we think it's about two. But they didn't really break it up. So we took that off, and we looked at those issues specifically, combined all of those correction factors. And it actually came out pretty close to what they had estimated, which I guess considering the caliber of neutron dosimetrists and neutron scientists at Mound is not too surprising. They were among the best in the country.

MEMBER CLAWSON: So on this data, you're saying that you had ten years worth of data, this y-axis MESH data?

MR. MORRIS: I'm sorry. Say it

again.

MEMBER CLAWSON: You had ten years of this y-axis? I'm trying to --

MR. MORRIS: So you're talking about the last few slides I showed.

MEMBER CLAWSON: Yes. You were talking about you have ten years.

MR. MORRIS: Yes, ten years from the early '50s to the early '60s for the health physics quarterly or monthly progress reports provided us in that categorical zero to 100, 100-300 millirem data or neutrons.

MEMBER CLAWSON: What did you use after that? Did they have --

MR. MORRIS: That was a good question. The MESH data ratios --

MEMBER CLAWSON: Okay. So then we were able to use the MESH database.

MR. MORRIS: We still think that is a larger number than we think is appropriate, but that is the data we have got.

DR. ULSH: Another way to say it is

when we got this data from the health physics reports, it is preferable to the MESH data because certainly it sets a bounding number, but it is a very high bounding number. We think that the health physics reports gives us a bounding number, but it is a more restrictive number. It is a more realistic number. So when we've got that data, we'll use it over the MESH.

CHAIR BEACH: Does SC&A want to present or --

MR. FITZGERALD: Yes, I think just briefly. I certainly want to acknowledge the amount of progress work that has been done over the past year. And this sort of started out as a bit of a blank slate. There has been a lot of progress on it. So it's very positive.

We had a technical call. And as was mentioned, we covered a lot of details which had been addressed. And there will be notes from that call available.

I think, really, there are two novel approaches. I don't know if I can call it novel but certainly ones we haven't seen. NTA film, of course, was rather universal across the Department.

So we've kept this issue almost in every SEC. And different approaches were posed in terms of how does one deal with the same issues as fading and energy dependence?

And the two aspects that I've -- and Ron I think will go through in detail, but the two aspects that we want to clarify and understand better, one is the -- I don't know if this has been applied before, but the MCNP model, you know, certainly a well-thought-out, well-researched, and respected model, I don't think I've seen it applied for this purpose at other sites. So I think we want to understand that better.

And the second thing is the constructive coworker model, which we didn#t get into in our technical call, I think we

want to expand upon it a little more, certainly those two issues.

The rest I think as we I thought made clear we felt were constructive to the site profile that you're revising. And I think we don't need to get into those specific details now. If anyone is interested, we will have some in this meeting, and we'll lay out those issues.

Ron, if you want to tee it off certainly first on those two issues or any other issues you think ought to be raised? And then others can get started on it.

MR. BUCHANAN: Okay. Well, thank you. And I thought that NIOSH did a very good presentation of what we plan on doing on the neutron issue.

For those who might not be familiar with it, I would like to put it in compartments so that you can wrestle with it maybe a little better.

We have the issue that the neutron

film measured the dose above half MeV. What do we do with the dose that wasn't measured below a half MeV? And so what kind of correction factors are appropriate to apply to the recorded dose to make sure the worker is assigned his full neutron dose? That is issue number one, which we'll get into the detail.

Issue number two is for the worker that should have been monitored for the neutrons and was not monitored for neutrons. Then what model can we use to assign him neutron dose? Okay.

So those are the two issues. And in the latter part, where the person was unmonitored but should have been monitored, there are two parts.

What they are doing here is looking at using the n/p ratio obtained from people who were monitored and apply it to that unmonitored worker or going back and looking at the neutron doses of people that were monitored and creating a coworker model.

Unfortunately, that is in categorical intervals, rather than exact doses.

And so those are the three areas I would like to expand on a little more and make SC&A's comments on. And so the first one is what do you do with the missed neutron dose below a half MeV?

Now, granted, the NTA film monitors the dose above a half MeV. And so sometimes the dose below a half MeV is rather small, like he illustrated, because the amount of neutrons needed to create a substantial dose that's small. As energy goes down, it does less damage to the tissue.

And if you have a bare neutron source and it's a small amount that's over dose, if the person is working around a very moderated source where the neutrons are thermalized a lot and get lower energy, then a lot of them fall below that threshold level. And so that could be a substantial person, a person's total dose.

Generally at Mound, you would not have 100 percent dose below the half MeV threshold. And so it's going to be some fraction of whole dose.

And so what they did, I would like to briefly go over their table 4-3. Would that be too much trouble to bring table 4-3 back up?

DR. ULSH: Yes.

MR. BUCHANAN: It would? Okay.

DR. ULSH: I do have hard copies.

MR. BUCHANAN: Because they broke it down into five factors there. And I want you to be aware of what factors we're discussing because they can all kind of run together.

If you turn to page 16, if you turn to page 16, table 4-3 -- and from Brad's question, I want to clarify something there. If you look at column 1, it is the year. And so then you look, column 2 is a correction factor that was applied by Meyers and his

group or recommended by the -- Meyers noted it. It was recommended by the health physics group.

In 1970 to '77 -- this is kind of an important factor because, you see, it's one down to 1969, which we agree with, and then they divided it by 2 because it had been doubled in the past. So we want to take that back out.

That's 1970 to 1977. So that was the period you were talking about, Brad.

DR. ULSH: Right.

MR. BUCHANAN: And so that is the reason that .15 appears there is that in the record, it has been doubled. So we want to unfold that and bring it back to where it should be. And we have some site profile issues about that, but they are minor, not fancy issues.

And so you will see that there are five columns there. And then there is a sixth column, which is all the correction factors

rolled into one.

Now, SC&A would like to discuss column 3, which the NTA film threshold response, from which this was derived using the Monte Carlo NP model. And so this is the one we want to discuss.

Column 4 is the neutron energy calibration source. And we do not have a problem with this because what this is saying is that the neutron source that was used for calibrating the film matched what was being used in the field.

Now, this is the raw source of neutrons, not what the worker was exposed to, but the origination, the nuclear reactor that created the neutron to begin with. So we don't have a problem with that.

The next one is track fading, as Bob alluded to. We do have some issues with that from 1963 to 1969, which can be resolved. Those were some more site profile issues, rather than SEC issues. However, if they

remain the way they are, I would consider them not reconstructing doses with accuracy.

And an angular response in the next column, 1.3.3; that is, if you are getting irradiated from the side, rather than directly on, that's fairly published literature. We do not have a problem with that.

And we feel that column 7 is a good move for the dose reconstructor. These are all multiplied out. And that's his final number over to the right there at what you would multiply it by, their recorded dose.

So what I would like to concentrate on is the third column. And then after we discuss that, I would like to move on to the NP models and the coworker dose models.

So factor 3 is the factor you can multiply the workers', the monitored workers', neutron dose by to arrive at his true dose, which includes the dose that was missed below the half MeV mark.

And so what NIOSH is proposing is

the MCNP model, which SC&A does not have a problem with the model itself. This is a fairly well-known worldwide model that you take data in, you sit up a parameter, you determine what amount of dose is missed below a certain dose amount. And then that gives you a factor, the output, 19 percent or 33 percent, 36 percent, or whatever.

And so the two issues that SC&A has are the input parameters and comparing any of the output to real Mound-reported data. And I would like to explain that at this point, then.

The way this MCNP model was constructed was they said, what was the likely moderation and scattering situation at Mound? And as you get more scatter, it decreases energy neutron. And so you register less and get more moderation. It moderates the neutrons. And you register less by NTA film.

So what they did was take a wall-less source, point source, surround it

with none, 2, 4, 6 inches of water in the middle of a concrete silo and take 12 inches of concrete -- and if I am wrong on any of this, jump in -- 12 inches of concrete on the floor, 12 inches on the wall, and 12 inches on the ceiling, 3 meters in diameter and 3 meters high, or something like that.

Anyway, it would simulate a person working in an environment with a source and the neutrons being thermalized or moderated. Thermalized should be moderated.

And then what would the operator get, 60 centimeters, and an observer, say, a rad tech or something out here, 240 centimeters because he would be closer to the wall. How much of his dose would be missed because of the scattering and moderation?

And in that handout they showed you, it shows some tables showing the percent missed. And what they found out was the observer actually missed more on his film badge, showed more of the misdose, than the

operator because he was standing by the scatter from the wall.

And this amounted to 19 percent for the polonium beryllium sources, which were used in an early part of Mound's operation, and would be 36 percent would not be registered during the polonium operations, such as the PP building.

And so if you take 1-19/1, you get this factor 1.23 you see in the third column there up through '63. Then in the mid '63, Mound went to using strictly a plutonium-like calibration because it's a lower-energy source. And so they looked at a use of plutonium factor of 36 percent. 1-36/1 is 1.56, which you see is the rest of the years that the NTA film was used.

Well, that's where the 1.23 factor and 1.56 factor come from. And we don't really have any heartburn with the NTA MCNP model and what they put in and what they got out.

Our two contentions are that we do not see that the input parameters, this concrete silo I was talking about, was actually taken from the Mound operating conditions. It is a generic.

This would fulfill most conditions at Mound of what happened, but we did not see, for example, say, five situations, a glove box worker, an RTG worker, whatever the operations were, say, and put into the model and see what the misdose below half MeV was on the output. That's a number one question on this. Is there a direct tie to Mound operations to set aside the SEC requirement?

Number two is, then once you got this output, it would be more substantial if we could compare that to some kind of benchmark pattern. I know that the reason we are creating this model is that there is not a whole lot of this information available.

But, as Bob pointed out, there were some measurements made. There is one

particular measurement that was made. In 1978, where they took NTA film and TLD dosimeters -- of course, the TLDs do not suffer from a half MeV threshold. In fact, it is more responsive at lower energy and less responsive at higher energies. Some develop a huge dose.

Anyway, they did a ratio. And this is where this magic number two came from originally to correct the 1970 to 1977 data was that when they were switching over to TLDs, they did NTA film and TLD badges simultaneously in the PP building and found out that they were missing about half the dose.

The NTA was reading about half of what the TLD was reading. And so that is the reason that they had a directive to go back and increase this dose by two.

So that is one benchmark that our MCNP model could be compared to. And I think it misses the mark some because they came out

with a factor of two just for the energy correction. This did not include the angular dependency and some of the other things that are in here.

And so SC&A's point is that we don't have a problem with the Monte Carlo model. We just have a problem with tying the inputs to actual Mound situations, validating some benchmarks on the output to show that the results limit or where do the results fall within the actual data.

Such tasks as OTIB-0049 were able to show that this bounded the situation. And how does it compare? If we did some real life in and out, would we see some trends we didn't expect or just some sort of physical real world validation of an input and output?

So that is where we stand on determining the misdose below a half MeV. Now, the other issue is, what if the person did not have NTA film and should have been monitored?

Yes?

MR. KATZ: I'm just going to suggest since that is a chunk right there maybe. That's --

MR. BUCHANAN: Okay.

DR. ULSH: Well, we discussed this to some extent, where these parameter values came from. I'll let Bob expand on that, but these were meant to represent realistic situations at Mound.

And I think I even remember Joe and I having a discussion about could you come up with worse conditions; in other words, conditions that would have led to more misdose? And the answer is, sure, you could have, but our response was that wouldn't be realistic for Mound.

So as you are no doubt aware, with any model, you want to kind of approach this from a sensitivity standpoint. And I think Bob has done some of that in terms of, well, what if the moderator was thicker than what we

have modeled? How much of an impact would it have had? And it turns out not much.

In fact, the parameter values that we picked, that was one of the specific questions that we asked the nonworkers that we met with during that outreach meeting.

Take a look at the parameter values that we picked, the conditions, the scenarios that we have envisioned. Are we off the mark here? Do these represent the kinds of situations that you had worked in?

The answer was, by and large, yes. I think they did suggest that we model a different physical form of plutonium.

MR. MORRIS: They did. They suggested that we use a plutonium oxide in aqueous solution.

DR. ULSH: Right.

MR. MORRIS: But the problem with that model is that the amount of plutonium that was ever in aqueous solution is so much less that it probably is sort of a trivial

example.

DR. ULSH: So these are not meant necessarily to be worst case in the terms of could you sit in an office somewhere and dream up a worst scenario, sure, but they're meant to be the worst kind of bounding cases that are realistic for Mound.

MR. FITZGERALD: Well, I will just interject. That's kind of where we're coming from. This is a generalized model, where you're picking admittedly conservative parameters. And we did have this conversation.

And you're trying to come up with this generalized model because there isn't sufficient site-specific data to allow you to model for Mound directly; in other words, be able to actually take actual geometry, actual operations. That would be a big job.

So I understand where this is headed, but I guess as I prefaced my remarks earlier, I don't think we have actually had

this recommended or proposed for the same kinds of issues that other sites and SEC -- I just want to step back and say, this is a generalized model where you have clearly selected conservative values.

But at least it makes us pause a moment and say, they're conservative values, but how is one able to establish an upper bound for the doses or exposures at the site?; which is usually the point we get to in these SEC conversations. And we're having some difficulty on that because it doesn't link back.

I think Ron actually sort of cited this. It doesn't link back to the site and benchmark in such a way that not only can we say, Yes. Certainly you did try to put conservative values in here.

But given the fact this is being proposed because there isn't site-specific data sufficient to allow dose estimation more directly and you're applying a generalized

model that isn't founded on specific Mound data, I think -- and this really is reminiscent of the surrogate data debate, where what kind of justification or how can one demonstrate that it is truly not just simply conservative but we bound the doses you would expect at the site.

I think that would lead us to saying it almost appears that one would have to benchmark against something that would demonstrate that not only is this conservative, but it's bounding.

MR. MORRIS: If you recall, one of the reasons -- we said this explicitly. Probably one of the most important reasons we chose to have a Mound outreach meeting on this topic was exactly to get the feedback that you're hoping to get in some context of saying, is this realistic for the workplace that you folks were working in?

I think we got that affirmation from them, don't you?

DR. ULSH: Absolutely.

MR. MORRIS: Yes.

CHAIR BEACH: Well, could we request NIOSH to validate its MCNP dose estimate by modeling against actual Mound data?

DR. ULSH: What actual Mound data would you like us to --

MR. MORRIS: You mean like get a blueprint of a room and room cuts? Once you starting putting in turn of this corner or that ventilation duct, the models get extremely complicated and become a Master's dissertation.

CHAIR BEACH: It would be nice for us to look at site-specific data. And the technical part of it is a little probably above me, but I would like to see something modeled that we can look at that is actually from --

MR. FITZGERALD: Even further back than that, you know, certainly it is a

laudatory thing to actually try to benchmark against the workers.

But I'm a little concerned about given how many years back we are trying to go back with the neutron issue, trying to recollect 30 or 40 years of history in providing that.

I haven't seen the interview notes. I think that would be useful for the Work Group to see the interview notes to understand how that all fed into this. But it's the one part of your framework.

I think the framework certainly has come together quite well. It's the one part of the framework which is somewhat novel to us. And we're trying to understand how that's going to present a bounding approach for that level below 500. And I think it contributes by having workers give testimonials.

But I just don't think that has quite the edge that would allow you to say it is bounding and there's not a concern over

whether this is representative of the site.

I think it is conservative. I am not saying it isn't. I think this is the one element of the framework we're just not quite there with yet.

MR. MORRIS: My problem is I can't take -- I understand the concern. I'm not sure exactly how to specifically --

MR. FITZGERALD: That's what I'm saying because I'm looking at this thing and saying I think that would be the caution I would have, but I don't have a proposal at the table.

I'm just saying how -- you know, you certainly considered that. And you certainly went to the workers as an avenue of trying to get some testimonials that this seems to be a pretty conservative approach and representative.

MEMBER ZIEMER: Josie?

CHAIR BEACH: Yes, Paul? Go ahead.

MEMBER ZIEMER: Well, of course --

well, this is for Ron. I'm trying to understand a little better the issue that SC&A has raised. As I understand it, Ron, you're asking, could the misdose below a half MeV have been much greater than NIOSH is projecting from the model? Is that the issue?

In other words, are there geometries that would cause a much greater amount of, well, I won't call it thermal but at least below half MeV neutrons that would result in a significantly higher misdose? Is that the issue?

MR. BUCHANAN: Yes, Paul, that's the issue.

MEMBER ZIEMER: And so that goes to I think the geometry assumptions and how realistic they are. How much moderation could you get?

Well, for example, could you show no spectra -- what was it, two and a half millirem, fast neutron cutoff, and still have a significant amount of some .5 MeV neutrons?

Are there some geometries that would do that? Is that what you're asking?

MR. BUCHANAN: No. I don't think at Mound we are proposing that the NTA film would rest or nothing above the half MeV and you would have a large dose totally below the half MeV. Our question is that below half MeV, we can't read that dose. So what do we assign? And it could be a reasonable portion of the total dose.

In this case, their MCNP model models that amount of dose below the half MeV, but we don't have any benchmark to show that it's directly related to Mound operation and data that was actually taken at --

MEMBER ZIEMER: It appears that one of your concerns is that the starting spectra may have been different than the calibration spectra or spectrum as the case may be. Is that right?

CHAIR BEACH: A lot of heads shaking no there, Paul.

MEMBER ZIEMER: Pardon me?

CHAIR BEACH: A lot of heads shaking no on that one.

MR. BUCHANAN: No. We don't have an issue with the neutron spectrum they're feeding into the model.

MEMBER ZIEMER: Okay. I thought you were concerned about the one column that --

MR. BUCHANAN: The correction factor, column 3, which is the correction factor that is applied to the recorded dose. Does this represent the correct amount of misdose below the half MeV threshold?

And we agree that it is conservative. And in most cases it probably does compensate for it, but we have not seen any proof in the pudding that it does compensate from examples taken from actual operations and recorded dose at Mound.

Whether the Board accepts a model that hasn't been validated anywhere with

benchmarks, that's more up to them. We would like to bring that point out.

DR. ULSH: Well, I've got a couple of thoughts on a number of things that have been said sort of a test. The first is the concern that we're asking workers to remember information from decades ago. And I think there is a bit of a double standard here because in other situations, concerns of workers have been raised up as almost the sole basis for SEC issues.

I would contend here that the group of workers that we picked were explicitly picked to be representative of the neutron expertise at Mound. These include people like [identifying information redacted], who I would say along with [identifying information redacted], Roger Falk are probably -- I mean, this is the foremost neutron expert in the country.

These are people who were hands-on. They were in the buildings. We aren't asking

them to remember exactly where they were at a particular point in time. We're asking them to remember essentially what kind of conditions they worked in on a day-in/day-out basis.

So I would say that that carries a lot of weight in this situation. Number one, it's the expertise of the people, but number two is the breadth of the people we consulted. So I would give a lot of weight to that.

In terms of could there be a large fraction of the neutron dose that fell below what we're detecting, you've got to keep in mind here that there are limits on how much moderation you can have.

I mean, you can't reach through an infinitely thick moderation. You can only reach through about six inches or so before you can't reach through it anymore. I mean, that's what we're talking about: shields that were placed in front of essentially glove boxes.

So there are practical physical limits on how much moderation you could have. And I think Bob clearly laid out that the dosimetric significance of these very low-energy neutrons is trivial. I mean, they just don't give you any dose, even if the flux is higher, to any great extent. And in terms --

MEMBER ZIEMER: Well, the flux has to be about three orders of magnitude higher per neutron to give you equivalent doses for thermals. It's a tremendous difference.

DR. ULSH: And I would say that that is an unrealistic expectation that there would be three orders of magnitude more flux at those lower energies. That is just not realistic.

CHAIR BEACH: And I think you have a comment while we continue. Sorry.

DR. ULSH: One last point. Sorry. With regards to this being a unique approach, I mean, it is really not much different from

the way we approach any site. It depends on the data that is available. And this is the particular data that we have available at Mound.

MCNP has been used, not just in industry in general but specifically in the dose reconstruction program. I think, although don't hold me to this, it was used in the glove box TIB, although that might have been another code similar to it.

MR. MORRIS: Similar code.

DR. ULSH: It was a TILA?

MR. MORRIS: A TILA. That's right.

DR. ULSH: Okay. Well, MCNP I think was used at the Hanford neutron dose approach certainly.

MR. MORRIS: Yes.

MR. BUCHANAN: Industry approach.

DR. ULSH: Yes. So it has been used. It's just not a completely out of the blue-type approach. It is specific to Mound, just like the neutron approach at Hanford is

specific to Hanford or the neutron approach at Y-12 is specific to Y-12.

CHAIR BEACH: One last comment from Kathy. And then we're going to need to take a ten-minute comfort break at this time. So Kathy?

MS. ROBERTSON-DeMERS: All I was going to say is I would reemphasize what Joe said, that we would like to see the notes from this worker outreach meeting.

DR. ULSH: And I don't know. Have those been put on the SRDB, Karin? Do you know?

MS. JESSEN: When I looked last time, they weren't there.

DR. ULSH: But we have them in the queue for loading up or --

MS. JESSEN: I would have to double-check that.

DR. ULSH: All right. We'll make sure that those --

MR. FITZGERALD: And, Josie, before

we lose the thread -- this will take 30 seconds.

CHAIR BEACH: Okay.

MR. FITZGERALD: First, as I said, I think the interviewing of the HPs and former workers is not only laudatory. It is a very good approach for benchmarking. What we're saying, though, is: is it sufficient? That's what we're telling the Work Group.

The second thing is certainly the MCNP as a proposed avenue of doing what it is being proposed to do for Mound is certainly the first time for the SEC discussion that we have seen. And that is the reason we want to certainly explore that and understand it better. And that's why I prefaced my remarks before.

So we're not saying it doesn't have applications. In fact, we know it has been applied in the commercial sector and is a well-recognized, respected model.

It is a generalized model. And one

had to take these parameters as we discussed, so just to make those comments. Let's take a break.

CHAIR BEACH: I probably won't let it go out either because I would like to see that in practice for my own benefit.

DR. ULSH: What do you mean in practice?

CHAIR BEACH: As a model to validate your model with Mound data.

DR. ULSH: Okay. I'm just trying to be clear about what it is you would like to see. What Mound data do you wish to compare against?

I mean, as we have talked about, the reason that we are taking this modeling approach, instead of using Mound data, is because there are problems with the Mound data.

So if you can give us some idea of what data you would like to see us benchmark against, that would certainly help us to

respond.

CHAIR BEACH: Let's go ahead and take a ten-minute break --

MR. MORRIS: And think about that.

CHAIR BEACH: -- and come back about a quarter after. Does that work? (***PART 3, 11:21:54***)

(Whereupon, the above-entitled matter went off the record at 11:05 a.m. and resumed at 11:21 a.m.)

MR. KATZ: This is the Mound Working Group. And we're coming back online. And I think we're still in the discussion about neutron doses.

CHAIR BEACH: Yes. And if there are no further comments on the first item that Bob presented -- Bob, you did have two other points to present?

MR. BUCHANAN: One other, I think.

CHAIR BEACH: Ron. Sorry.

MR. BUCHANAN: Two other points. Yes. One other major point with two parts.

CHAIR BEACH: So Ron, instead of Bob. Thank you. Excuse me.

MR. BUCHANAN: Okay. Now, we talked about the one subject of missing the dose under half MeV. The second part was for the person that wasn't badged wanting to assign them for neutron dose that should have been monitored.

And there was the possibility of using the badged people's information and determining coworker dose and then also using some records that were categorical and then also using the person's photon reported dose and assigning an n/p ratio.

So SC&A's stand on those two issues was, number one, we look at determining an n/p value from the recorded doses. And we do not have a problem with this method. We discussed on the phone some reservations about the values that are showing in the table of the handout that they fluctuated quite a bit and such.

This was not addressed in this meeting to any degree, but we don't have a problem with the method. It's just the actual values that appear there. And I was trying to find which table that is because also we have the handout.

This is on page 21, table 4-4. And this would cover the '49 to '77 time frame. And you see there in the column there the 50 percentile, the 95th percentile. We have ranging of .6 to 18.6 as the n/p ratio for the 50th percentile and the 95th percentile 1.137.

Realistically this is quite a wide swing. And so we would like to see further work or comments on that as far as using it for an actual dose reconstruction.

Generally your n/p ratio in working environments, these types of sources would probably run from one or less up to 10, maybe on the outside 20. So we figured it would be 37, 34 values are probably extremes. But we do not feel that, like the 2.6 or 2.8 and the

lower values would bound doses for some situation. So that would be one way to assign dose if you did not have recorded dose.

Now, I understand NIOSH to say they felt these were maybe high using this. Perhaps I would like to ask a question of NIOSH because it was kind of conflicting in the white paper.

Do you propose that table 4-4, the 95th percentile is bounding or just conservative?

MR. MORRIS: We think that it's useful for dose reconstruction. And we have taken your comments under consideration. And we will probably revise those upper 95th percentile numbers as bounding.

MR. BUCHANAN: Okay.

MR. MORRIS: This is different from what we discussed. Is that right, Ron?

MR. BUCHANAN: Yes, that's right. We just wanted to make the --

MR. MORRIS: We're taking your --

MR. BUCHANAN: In the white paper, it does make a statement that these n/p ratios are maximum or I assume that means bounding. And I want to clarify that at this point. Do you feel that they will be when you revise them?

MR. MORRIS: We think they will be when they are revised.

MR. BUCHANAN: Okay.

MR. MORRIS: They will be useful as an SEC bounding calculation.

MR. BUCHANAN: Okay. That's all I had on the coworker derived from reported dose.

CHAIR BEACH: Okay. Any follow-up from NIOSH other than what Ron has said?

DR. ULSH: Are there more issues that you are going to --

MR. BUCHANAN: They're half of it. It's coworker from the categorical I wanted to address.

CHAIR BEACH: Go ahead.

MR. BUCHANAN: Okay. So the second half of determining the dose to an unbadged worker was NIOSH feels that the n/p values were somewhat excessive. So they went and got the categorical data and looked at it.

Categorical data is film badge results from actual workers that did not have the actual dose. It is actually when they made these reports, they put it in bins or categories zero to 100, 100 to 300, or above 300, this sort of thing.

And so what this does is give you an idea of how many people were in a certain dose range but not the actual dose. So what I did is I analyzed this table. And in your handout NIOSH provided, that is in table 6-2.

What I would like to do is to look at -- I understand the definition of coworker dose.

CHAIR BEACH: Do you have a page number for 6-2?

MR. BUCHANAN: Oh, 28.

CHAIR BEACH: Thank you. Sorry.

MR. BUCHANAN: Page 28, table 6-2. My understanding of coworker dose is that some were monitored and some were not monitored. So you would use the ones that were monitored. And that would reflect the dose of the average worker in that group at that time or the person that wasn't monitored.

So there should be some correlation between the dose that the person received and the person that wasn't monitored. It should follow some trend on dose values.

If you look at table 6-2, you will see that the numbers they will use, the median value in column 5 or the 95 percentile in column 6, if you look there, you can categorize the first full increase as around 360. You can categorize the next entries down through March as around 200. And you can categorize the rest of the order entries around 600.

What you find out is that these

values follow the exchange recordkeeping cycle, as opposed to a measured dose. So that if it was weekly, it ran around 360. If it was on a monthly recordkeeping basis, if it was an exchange, it was every two weeks. And if it was a monthly recordkeeping cycle, it was 200. And if it was quarterly and every 2 weeks exchange, then it was around 600-700 millirem.

The amount in the upper brackets above, so essentially it boils down to the 100 millirem interval multiplied by the, adjusted by the, exchange in recordkeeping cycle, that it does not really reflect much on what is above 100, in the 100 to 300 or above.

The 95th percentile reflects it a little more. Because you get some of the upper extremes, but it still follows that general cycle.

SC&A's position is that the coworker dose based upon this categorical data at this point is not sustainable as a good

working model.

CHAIR BEACH: Thank you, Ron.

NIOSH?

DR. ULSH: I think you hit the nail on the head, Ron, that the medium dose tends to be influenced heavily by the badge exchange cycle. And that's because most of the badge reads resulted in non-detect.

So I think you've got that part of it right. I didn't quite follow why that is not valid to use for coworker data, though.

MR. BUCHANAN: Well, the coworker data in a medium neutron dose is a function of the exchange cycle and the read cycle, which doesn't really reflect actual recorded dose.

MR. MORRIS: It does reflect recorded dose as corrected or missed dose.

DR. ULSH: Right. It reflects the fact that those badges were in less than detect. And that would tell you that unless the median is right around the limited detection, it would tell you that 50 percent

of the people got right around the LOD.

And, furthermore, I mean, what we are talking about here, these are the people who are permanently stationed in, say, for instance, SM building. It's reasonable to presume that the monitored workers were ones that were at least judged to be at highest exposure potential.

So when we are talking about an unmonitored worker, in the Mound-specific situation, what we are talking about is someone who went into, say, for instance, SM building, maybe a plumber, maybe a carpenter, who was not permanently stationed in SM building but was a visitor to that building, not to the site but to that building.

And they picked up a visitor badge, a visitor photon and neutron badge. They went into the site. They came back out. Unless their photon badge read above a certain level, they didn't bother to read the neutron badge.

So I would propose to you that

those people that fall into that visitor-type category were certainly at far lower exposure potential than the people who were badge and permanently stationed in SM.

Therefore, if we're applying a coworker model based on the people who wore badges who were, in fact, overestimating by quite a bit the dose that those unmonitored people could have gotten on a one or two-day entry into that building, the fact that even the monitored workers got right around the LOD just simply indicates that, well, I would say it indicates that, number one, they were badged frequently and, number two, it indicates success somewhat in limiting neutron dose.

I don't see why even at 100 percent or more LOD, why it would not be bounding or sufficient to estimate the unmonitored workers' dose at the LOD. I mean, that's --

MR. BUCHANAN: Well, because in this case the dose you would assign would

depend upon the exchange cycle and the degree of the cycle of the recordkeeping, as opposed to any measured dose --

MR. MORRIS: That's what it is when we do a dose reconstruction with this data right now. If there is an identified monitored worker who shows up with this NTA film right now we assign, most of the doses are driven by the missed dose concept.

MR. STEWART: Measured dose is a small fraction of the dose we assign in Mound claims.

DR. ULSH: In any claims, really.

MR. SHARFI: It's true for any assignment. They're driven by this list.

MR. STEWART: There are exceptions. If the person worked exclusively with neutron sources, then their measured dose may eclipse in this dose to a greater or lesser degree.

DR. ULSH: There are very few situations across the complex where most of the dose if you look at a coworker

distribution is above the LOD.

There probably are some, but I would say they are pretty darned rare. This is not a Mound-specific situation.

MR. BUCHANAN: But if you step back for a minute, you are essentially saying if a person is unmonitored, you are going to assign them misdose.

DR. ULSH: Correct.

MR. STEWART: We don't have much -- there are two kinds of unmonitored doses. Those doses that have a zero in that column for that year because we only have annual data are assumed to be monitored and, therefore, get misdose.

If they state that they are not monitored in that year, which some records do, or if that year is missing from the MESH printout, that worker is assumed to be unmonitored in that year and does not receive misdose.

MR. BUCHANAN: But in this case,

this would be used for workers which should have been monitored, not monitored --

MR. STEWART: Correct.

DR. ULSH: It would be used for workers in that situation that I described. It went in on a visitor badge because their gamma dose didn't exceed that threshold. They didn't bother to read the neutron badge, the assumption being that, well, if the gamma is not passing that number, then the neutron certainly wouldn't.

We are not accepting that rationale at face value. We're saying no. We're going to go back and assign the neutron dose.

MR. BUCHANAN: Okay. And so we went back and assigned a misdose on their badge cycles would be a simpler process and essentially what we're doing here.

MR. MORRIS: Except at the 95th percentile.

DR. ULSH: Well, in some situations.

MR. MORRIS: I think generally you're probably close to right except for the median value. Ninety-fifth percentile value tends to be a little higher than that.

MR. BUCHANAN: I don't disagree. I'm just saying, is that an acceptable practice when it boils down to when you have an unmonitored worker which you want to assign dose to, essentially, say that we're going to assign him misdose because that's what the badge results showed on a general categorized basis? Is that an acceptable practice?

DR. ULSH: I don't think that would be acceptable if the actual coworker distribution of the monitored workers showed a median dose that was above the LOD. In that situation, if we said, "No. We're going to give a misdose," that would not be appropriate. But the fact that we have looked at the actual monitored worker population and the median dose is at the LOD, then that's what you use. It's not necessarily just

applying misdose. It's based on the experience of the actual worker population.

Now, that happens to be at the LOD, but that's reflective of the situation at the site. I don't know what else we could do. We can't make the median something different than it actually is.

MR. BUCHANAN: We do have some detailed data. I mean, for years -- this covers '51 through '60 or you say it will from the phone conference. You have some more data to fill in some of these months that aren't available as we went to a period of time, say, '62 or something and saying, how does this apply during this period when we do have some other data? Have we checked to see if this is realistic?

MR. MORRIS: Are you saying have we taken a monitored worker whom we have data for and reconstructed the dose --

MR. BUCHANAN: Right and compared it.

MR. MORRIS: Well, of course, you will find that some people have more and some people have less. That's the definition of median and 95th percentile.

MR. BUCHANAN: This is the first time, just like the Monte Carlo monitoring, this is the first time I have seen the categorical badge data used for coworker.

MR. MORRIS: The only question really is, how do you take numbers that were traditionally are integer values and we end up making an assumption that it's the middle of a distribution, instead of an actual number lower or above the middle of the distribution?

But our bands are pretty tight. It's not like they're spanning from zero to five rem and five to ten rem. They're fractions of a rem.

So I don't think that there's a lot of lost information by the fact that it's categorized. It's still pretty tightly binned data.

DR. ULSH: In fact, since it's a log-normal distribution, almost certainly if you actually had the data to look inside those bins and see how many -- see, the first bin is zero to 100. If you had the power to look inside those bins, you're going to find that most of them are clustered right around zero.

So by using categorical data, we're being claimant-favorable.

CHAIR BEACH: So can you provide the Work Group with a model that has been validated against representative Mound doses, actual doses of record?

MR. STEWART: We have data for some years. In some claims, we have actual individual cycle data. And that I don't remember whether the later years have neutron data or not, but form 1015 in some of the claims has this information in it.

DR. ULSH: So what kind of a test are you looking for here? If we take a worker who is monitored and we have his gamma and his

neutron but we just say, "Well, let's just pretend that we don't have the neutron" and estimate it using this coworker model, does it over or under-predict the dose that we actually got?

Is that kind of what you're asking here? Well, half the time it will and half the time it won't.

MR. SHARFI: What's the value? He's a monitored worker. You can't treat him as a non-monitored worker, unmonitored worker, because he should have had dose because that's why he was monitored.

You can't put someone in a position where you would expect him not to have dose when he actually worked in a position that did have dose.

CHAIR BEACH: I just need to be able to validate what you're doing with the coworker model.

MR. SHARFI: We've done this before. This is not the first time where we

have seen a median zero dose.

DR. ULSH: Pretty much every other site where you have a coworker distribution. There might be a few where the median --

MR. SHARFI: On the DOE site, especially in the AWEs, you see a lot of sites where you can find median doses were all below the limited detection. So then your coworker, really, your median coworker, would be all missed steps.

DR. ULSH: I think what you are asking us to do is test the coworker model against the data which was used to build the coworker model.

CHAIR BEACH: Actual data.

DR. ULSH: But you can't test the model against the data that was used to build the model. It doesn't tell you anything.

MEMBER ZIEMER: You are testing it against itself if you do that --

DR. ULSH: It is a tautology.

MEMBER ZIEMER: Yes.

MR. BUCHANAN: What I think it boils down to is, the end concept -- and I haven't seen the category-type data used before for coworker, but the end concept is, is it allowable to assign misdose to people that weren't badged because essentially that's what it boils down to.

MR. SHARFI: Theoretically you're not really assigning misdose to them. You're saying that misdose is about as bounding as you can get for the 50th percentile. And you're saying that I can't see anything below the limit of detection. And, therefore, really the coworker dose is something under misdose, but that's about as good as I can bound it.

DR. ULSH: It's an overestimate.

MR. SHARFI: Really, it is an overestimate because you don't have the numbers below the limit of detection. So, really, their real coworker dose is something under the limit of detection. All we can do

is since it's under the limit of detection, all we can do is give them misdose.

MR. FITZGERALD: You're purposely overestimating, really, is what you are doing. That is as tight as we can get.

MR. SHARFI: That is as tight as you can get.

MR. FITZGERALD: I think that helps.

DR. ULSH: And that's the situation at every site because dosimeters at every site have a limited detection.

MR. BUCHANAN: At other sites have ended up with neutron coworker dose being assigned, mainly by misdose.

MR. STEWART: Well, all external coworker dose models include misdose, neutron or photon.

MR. BUCHANAN: But this is the first time I've seen it. And maybe this is standard practice, but at Rocky Flats and such, did we run into where the coworker

neutron model essentially boiled down to misdose?

DR. ULSH: Well, the problem with Rocky Flats was we were told that we couldn't estimate neutron dose as the basis of the Rocky Flats SEC. So that is probably not a good --

MR. BUCHANAN: Well, whatever. Hanford is coworker neutron dose usually boiled down to just misdose.

MR. SHARFI: That would vary site by site. I mean, I can tell you I have seen gamma doses where the median for gamma dose was misdose in certain years alone.

So if you had neutron dose, I would imagine neutron dose probably would be, too, not for all years, but I have seen years where the 95th is the only thing that is really above the limit of detection. The median doses are all below the limit of detection.

So this isn't something we haven't seen before, probably more common. I would

imagine it would be more common with neutron because a lot of sites badged, over-badged, people that didn't require neutron dosimetry. So you are going to see a lot more zeros.

DR. ULSH: And the LOD is higher.

MR. SHARFI: Yes. And the LOD is much higher. So if you are badging people on a weekly basis, you are probably never going to see enough exposure to hit those limit of detections.

Really, if they were to badge people quarterly, annually, the cumulative dose would kind of get enough to see above the limit of detection. So by badging people more frequently, you're really over-assigning dose by giving them misdose because you never really hit that cumulative dose enough to hit the limit of detection.

DR. ULSH: That is the last issue you were --

MR. BUCHANAN: Yes.

DR. ULSH: If I could be

presumptive here, what I might --

CHAIR BEACH: Go ahead.

DR. ULSH: What I might suggest is that during our conference call a few weeks back, there were some action items that came out of that. They're going to form the basis of a revision to the white paper.

I would say I've talked to Bob. And a realistic estimate is two, maybe three weeks for us to revise the white paper to address those points that were raised in the conference call. We will issue that white paper.

CHAIR BEACH: Now, does that need to go to DOE?

DR. ULSH: Yes.

CHAIR BEACH: Yes. So two to three weeks pretty --

DR. ULSH: Yes.

CHAIR BEACH: So four to five weeks, I mean, really.

DR. ULSH: It's been pretty quick

lately, but I don't know that we can --

CHAIR BEACH: Okay.

DR. ULSH: We will get it out as soon as we possibly can.

CHAIR BEACH: Okay.

DR. ULSH: And then if there are continuing points you want to raise, like, say, for instance, those that you raised today --

CHAIR BEACH: And that's where I was going to get to, is NIOSH has agreed to update their white paper based on your technical call and the action items that came out of that.

They're also going to place on the O: drive the interview notes from the April meeting. First week of April I believe is what you said.

DR. ULSH: Yes.

CHAIR BEACH: So we should see those on the O: drive relatively soon, I am assuming.

DR. ULSH: Right.

CHAIR BEACH: And then, SC&A, are you planning on a white paper or are you going to wait for the updated white paper before you add your comments?

MR. FITZGERALD: Well, one, I think we sent a draft set of interview notes -- not interview notes, meeting notes that would be helpful. I think it would be a help just to -- I think that was a pretty productive meeting just sort of to benchmark what you may see as changes in the white paper. That would be helpful for the Work Group to have.

In terms of what we would do, you know, we always speak of the issues. You sort of lose the forest. In this case, I thought we pretty much agreed with the factors that were being proposed and whatnot that would be reflected in these minutes.

So, really, I thought what we did today, just kind of highlight what would be the remaining questions or concerns. And I'm

not sure -- you know, in terms of a white paper, I think we've said just about what we can say at this stage.

I do agree that I don't have a ready answer, not to reopen this whole big, long discussion, but on the MCNP in terms of generalized model, I don't have a real good answer about how one would benchmark. Perhaps there is an avenue by which one could look at that issue.

I mean, I don't see a white paper saying that.

CHAIR BEACH: Right.

MR. FITZGERALD: But I think that would be the question at this point, whether there is any way to do that.

The only other thing I would add to that just so it's a complete record is in terms of picking the conservative representative sources, you mentioned three sources, did those include the and for the folks that worked at Mound, the special

operations and the SM, sort of military application activities? Because that would certainly be something I would be concerned about, making sure that in terms of sources that they are representative of all of the sources.

DR. ULSH: It would certainly include -- well, the group of workers in the top certainly included people who would have been involved in overseeing that kind of work. I mean, we didn't talk explicitly about that.

MR. FITZGERALD: Right. It's classified, some of it.

DR. ULSH: Well, with good reason.

MR. FITZGERALD: Yes, right. And I just wanted to make sure that, you know, since that would have been a source, that that's --

DR. ULSH: Well, we didn't talk about it specifically in those terms during the outreach meeting. The outreach meeting would have certainly included people who would have been familiar with that work.

And we put the question out. Due to parameters that we pick, the scenarios that we pick represent what you have experienced?

And the answer was yes. It wasn't yes except for some situations.

MR. FITZGERALD: Right.

DR. ULSH: It was just yes.

MR. FITZGERALD: I think that's the nature of our comments. I mean, those are the comments we would have. You know, beyond what Ron mentioned on the coworker model, I think the question of applying the general model and upper bound, I think that is kind of one concern remaining for the overall framework.

So we would weight the white paper. But certainly at this stage, I would see that one as being probably the one that, you know, takes some effort or some discussion.

CHAIR BEACH: Right.

DR. ULSH: Well, our white paper doesn't reflect what we talked about in the conference call.

MR. FITZGERALD: Right.

DR. ULSH: They're probably not going to talk to the issues that we have discussed today. It would be much easier for us to respond appropriately if we had a more solid feel for what you are proposing, what kind of issues.

And we talked about it. If we had something in writing, it would help us get our arms around. These are exactly the points.

MR. FITZGERALD: Why don't we write -- a white paper sounds enormous. Why don't we write a memo through the Work Group and with a copy to you, obviously, to sort of articulate the two or three-part -- okay, two-part with a second to highlight what we have talked about in the table for the record in writing and go from there.

DR. ULSH: Will that come after our white papers?

CHAIR BEACH: That was my next question. After --

MR. FITZGERALD: I don't see why we have to have a white paper. White paper is based on the technical call. The worker will have to administer that call. And you can see where we are going with that.

This is a derivative from that conversation, but these are more getting down to sort of the end issues of SEC's importance. I think that we can do in parallel, get to the worker and Brant and his team probably in the next week or two, couple of weeks, no more than that.

CHAIR BEACH: And if it's needed, we can always convene a conference call Work Group meeting over the phone to address some of those issues.

MR. FITZGERALD: I mean, we have winnowed down quite a bit.

CHAIR BEACH: Yes.

MR. FITZGERALD: I mean, I think these are more or less where the implications are applying this and trying to understand

whether it answers all the big questions or not.

MR. KATZ: So, Joe, when you go back and compile this memo, are you going to consider whether you have any suggestions about benchmarking?

MR. FITZGERALD: Like I said, I think that's -- you know, I agree it's not an easy question, but, you know, it's sort of a circuitous logic thing. If you don't have site data --

MR. KATZ: Right. I understand.

MR. FITZGERALD: -- you're coming at this model. And then you kind of benchmark what you know is not there. So I talked to Ron. He mentioned one data point.

I'm just trying to -- I think it's one of these things, can you, in fact, do it or not? And what value would it be? I think that's something that we --

MR. MORRIS: Let me suggest that there might be more value in thinking of it in

terms of sensitivity analysis. It's like, how different would things have to be before they change much?

MR. FITZGERALD: Right.

MR. MORRIS: And I think to some extent, we did that with the table that shows the different shielding thicknesses for each of the observer positions, the operator observer positions.

MR. FITZGERALD: Right.

MR. MORRIS: You can see that a six-inch water shielding is probably an overestimate of reality of the thickest shield that was there.

And so you can see that the changes start to plateau out.

MR. FITZGERALD: Yes. I think the thing that would help would be to actually take some representative Mound geometries. I mean, there's one, not to keep going back to that example, but this SM activity had a neutron source. What would you expect from

that? And why would you feel that this would, in fact --

MR. MORRIS: Perhaps we should just invite you to say what other sensitivity parameters do you think we should test? I know we have tested water, for instance.

MR. MORRIS: Right.

MR. FITZGERALD: Are there other parameters that you think we ought to iterate on?

MR. MORRIS: Well, I think there is a lead-in question, which is, is there any way one can demonstrate an upper bound without going back to the site in terms of specific data? That is sort of a lead-in question.

The second thing is, if one cannot do that, can you use the approach you're talking about, which is achieve a degree of conservatism, which would give you confidence that even without being able to demonstrate an upper bound, you feel pretty conservative that the sources had been enveloped and are

representative and that kind of thing?

I think as a two-part thing, can one establish an upper bound based on actual site data? Right now I would say it looks awfully difficult for reasons we discussed.

The second thing is, then, if one defaults to a sensitivity analysis, saying let's make this as conservative as possible based on what we know and the people we've talked to, then I think we can explore. Are there ways to do that better than have been done?

I think we would take it as a two-part approach, saying let's address the first one, then address the second one as a fallback because, again, this is kind of a relatively new issue. I don't have the answers.

MEMBER ZIEMER: Joe this is Ziemer. I think it makes sense to use the sensitivity analysis because that will at least give you some level of confidence as to whether or not

the bounding is reasonable.

MR. FITZGERALD: Well, there's no bounding. I mean, the dilemma is --

MEMBER ZIEMER: Well, you're asking whether you can bound the doses. The sensitivity analysis will at least give you a feeling for whether your --

MR. FITZGERALD: Yes, confidence.

MEMBER ZIEMER: -- you are close.

MR. FITZGERALD: Right, right. That's what I'm saying, that without the first, this would give us additional confidence --

MEMBER ZIEMER: Right.

MR. FITZGERALD: -- on the conservatism. Right.

MEMBER ZIEMER: Right.

MR. FITZGERALD: We're in agreement.

MEMBER ZIEMER: And I am not sure what other approach NIOSH could take. I don't think we're talking about validating the model

per se. We're really talking about whether or not the model is giving you useful information for this situation.

MR. FITZGERALD: Agreed.

DR. ULSH: I still want to get into this bring me a rock situation. Let me try to kind of guess where you are headed and anticipate that. And then it turns out that is not really kind of what you are looking for. It would be helpful to us if you could give us a pretty clear picture on what you're looking for. And then we'll --

MR. FITZGERALD: We may have a technical call if we get to a certain point where we'll discuss this. I used the word explore because, really, I think this is a difficult question. I think this is a lot worse than was done to push this in the right direction.

But I think validate is probably not the right word but just looking at the bounding nature of the confidence. And that

bounding nature is kind of where we are at.

MR. MORRIS: This will approach diminishing returns real quick on --

MR. FITZGERALD: Yes.

MR. MORRIS: -- how much effort it takes to get a little bit more data.

CHAIR BEACH: Yes. Are there any other issues or action items that I may have missed that we need? And then if everybody is in agreement, we can move on to our next topic, which the question of the day is, do we go ahead and start with NIOSH's presentation and then take a break in the middle of it?

I know we have people joining us via phone. I hate to go to lunch so early.

MR. FITZGERALD: Why don't we check and see if they're on?

CHAIR BEACH: Okay.

MR. FITZGERALD: Is Joyce Lipsztein and Bill Leggett, are you on? Is Joyce Lipsztein or Bill Leggett on the phone from SC&A?

DR. LIPSZTEIN: I'm on the phone.

CHAIR BEACH: Okay.

DR. LIPSZTEIN: I just saw an e-mail from Rich that the Work Group was behind schedule. So I can reply to him saying that.

MR. FITZGERALD: Yes. Josie is trying to determine how to schedule the discussion on PU-238. So you are very important for that.

Josie?

CHAIR BEACH: Well, I would propose that NIOSH present. I don't believe your presentation will take more than a half-hour or so. Okay. If NIOSH presents? And then we will see where we are on time.

MR. FITZGERALD: As long as Joyce --

CHAIR BEACH: As long as Joyce is okay with that or we can just push on through.

MR. FITZGERALD: Is your schedule flexible, Joyce?

DR. LIPSZTEIN: Yes.

MR. FITZGERALD: Okay. So we can. If we have to break for lunch, you can come back?

DR. LIPSZTEIN: Yes.

MR. KATZ: Let me make sure. Liz and Tom LaBone, are you on the phone?

MS. BRACKETT: I'm here.

MR. LaBONE: I'm here, too.

MR. KATZ: Okay. They're both here.

CHAIR BEACH: And then before we go on, you had your hand up earlier. Did --

MS. JESSEN: No. I was acknowledging.

CHAIR BEACH: Okay. Perfect. Okay. Sorry. I just want to make sure.

Okay. Then we'll let NIOSH get started.

DR. ULSH: All right. To give a brief history of this issue, this high-fired plutonium-238 issue, I think SC&A raised this

concern about high-fired plutonium-238 and its possible presence at Mound based, I guess, largely probably on the situation that was observed at Los Alamos, the Wing 9 incident.

Basically the Wing 9 incident involved the destruction of an RTG. This RTG had been subjected to some vibration tests.

By the way, RTG is radioisotope thermoelectric generator. So if you think space power; in other words, satellites, they put these devices on them to power them. And Mound was heavily involved in making these things.

So they took one apart at Los Alamos. And it resulted in some of what we considered unusual biokinetic behavior of this material.

There were some workers that were exposed. And the excretion patterns were not typical of what you might expect from plutonium-238.

I think that was kind of at least

one of the initiating events, for SC&A to ask that question about, might this be an issue with Mound.

There have been a number of iterations back and forth. We have issued, we, meaning NIOSH/ORAU, have issued, a white paper that proposes a model to handle this situation at Mound. SC&A has issued a response to that.

One of the issues I think continues to vex us. At least it is my observation that we say that we haven't seen the Los Alamos-type material at Mound. And SC&A presents examples, what they consider to be examples, of exactly that. And I think --

MR. FITZGERALD: Not exactly that.

DR. ULSH: Not exactly.

MR. FITZGERALD: Right.

DR. ULSH: But I think we might be talking past each other on that one. What we mean when we say that we haven't seen this kind of behavior at Mound, I think we would

grant, certainly we would grant, that there is non-monotonic behavior, which means that if you were to measure the concentration of plutonium-238 in the urine following an intake, non-monotonic would mean that you see a level and then you test a little bit later and throughout time and it rises, initially rises, the concentration in urine rises and then levels off and tapers off.

We would certainly grant that you see that kind of behavior at Mound. But it's that initial -- degree to which it doesn't show up in the urine.

We don't see the same kind of behavior at Mound that is seen in the Los Alamos incident. So the material at Los Alamos was extremely insoluble initially. You almost saw nothing in the urine. I think we don't see that at Mound, but we do see this non-monotonic behavior.

So I think to some extent our two statements are talking --

MR. FITZGERALD: Well, because of the genesis of the issue, I think.

DR. ULSH: Yes. So we have issued our white paper. And SC&A has issued a response to that. At this point I think I would like to turn it over to Liz and/or Tom. I'll let you guys flip for it and walk through some of the points that were raised. (***PART 4, 12:02:50***)

MS. BRACKETT: I will start with this. I would just like to expand a little on what Brant said in that I would think probably the initiator of this at Mound was that there was an incident at Mound, in particular, that involved several people that showed this non-monotonic behavior. It's just that there had been a paper published on the Los Alamos data with material that appeared as though it could be similar.

So we do have quite a few Mound-specific cases with data that we used to develop the model. It's not necessary to look

to Los Alamos. We could use Mound-specific data.

We can get more into the model itself later. And I will let Tom do that because he actually developed the model. But the white paper that SC&A wrote, they stated in a few different places that they agreed conceptually that a bounding model could be developed. But their issue was its application. And they questioned the ability to meet the sufficient accuracy test.

So from a standpoint of an SEC, then, the model development wouldn't be an issue if there is agreement that we could actually develop a model.

We feel that we have developed it, as Brant mentioned. And we based it on the Mound data. But the white paper then goes on to state; the SC&A white paper, that is, that a similar model is developed.

Several items need to be addressed. And I will go through these here. We don't

feel that any of these issues are actually plutonium-238 or in some cases even Mound-specific.

They're somewhat generic issues that we deal with across the complex. And we addressed some of them yesterday in other conversations and other topics, such as the stable metal tritides.

The first item, they say that we need to explicitly state to whom the model will be applied. I believe we addressed this in the last Work Group meeting in October.

And we said that we would apply that to anyone who had the potential for intakes of plutonium-238. So that would be anybody who had a bioassay result indicating that they had or were indicated to be for plutonium-238 or someone who worked in an area where plutonium-238 was handled.

Again, this issue was somewhat discussed yesterday and when we were talking about how we determined what nuclide to apply

to an individual.

The second item was how we would recognize the occurrence of ceramic plutonium-238. We have stated that this would be just another material type that we would use to model the plutonium.

The SC&A document states that there were ample opportunities for exposure to the special absorption type and that, in fact, there were uptakes of it.

So, given that, if there exists a possibility that people would have been exposed to it, then we feel it's appropriate to just add it to the M and S types that we would normally assess for plutonium-238 and make this a third type that the dose reconstructor would evaluate. And they would select the one that gave the largest dose.

I believe there was some concern that this would result in too large of a dose and, therefore, not be a sufficient accuracy requirement.

But this form, this type set, the model that we have developed, does not result in extremely large doses relative to the other material types. And, in fact, types M and S will give a larger dose in many situations.

The white paper that we developed goes through different scenarios of acute and chronic intakes and bioassay collected at varying times following intake. And this type does not always yield the largest dose to a particular ordinance.

The third issue was how we would handle results below the MDA. Well, we have a standard method for assessing results below the MDA. And we see no reason why this would be any different from any other material type.

And this is addressed in OTIB-0060. It's called assumptions that the dose reconstructor uses in how the MDA or less than MDA results are handled.

The fourth item is, how do we differentiate bioassay results for

plutonium-238 versus other alpha-emitting radionuclides, including plutonium-239?

There was an extensive discussion yesterday about this subject regarding gross alpha results or results that were specific for plutonium-238. So I believe this was addressed at length. Then we can go back and revisit it if necessary, but I won't do that right now.

DR. ULSH: It was also addressed in the October Working Group meeting. It was raised and addressed there, too, as were a number of --

MS. BRACKETT: Right. And the fifth and final issue on this list of items in the white paper is how we would use bioassay results to use a coworker model for plutonium-238 if solubility types of compounds are unknown. Again, this relates to some of the other issues. We would treat it as just a third solubility type for plutonium-238.

The coworker studies when we do

them, we come up with the set of bioassay results. And then those results are modeled with each possible material type for that given nuclide.

And all of them are presented in the coworker OTIB. And the dose reconstructor would run each of them for the particular case and assign the intakes that yield the largest dose for the particular situation.

I think one thing that I would like to point out is that there has been some discussion in this white paper about having to look at different scenarios because this material behaves differently. And while that's true it does behave differently, that is not a reason to change our default assumptions.

I think one issue is that when I personally think of applying these models, I am envisioning more of the people who have mostly no results greater than the MDA or at most one or two because that is the majority

of cases that we see, people who didn't have large potentials for intake or large intakes where they have positive results. And so we used the false assumptions to model those people given a lack of any information at all.

These are standard default assumptions that you would use, even outside of the project, for example, when you would assume an acute intake occurred.

If there were more positive results for a person, then certainly we would look at the individual's data. We wouldn't necessarily apply default assumptions. The dose reconstructor would have to look at the pattern of results for the person and make decisions based on that.

But also keep in mind that most cases don't require what we call a best estimate. Don Stewart discussed this yesterday. I forget what issue we were discussing. In many cases an under or an overestimate is sufficient for the requirement

for this program.

So you don't need to get into the fine detail of the specific pattern for the person. You can do the claim in an expeditious manner by making some assumptions without having to get into a long complicated process and doing the best estimate.

MR. KATZ: Liz, can I just interrupt you for a second? It's not such a bother in the room, but it might be for other people on the phone. Someone's phone is not on mute, and we have some music in the background. So somebody needs to mute their phone unless that is on your end, Liz.

MS. BRACKETT: It's not me. I can just barely hear it.

DR. ULSH: We've had enough Time-Life background music

MR. KATZ: It just went away. Thank you, somebody. Oh, no, it didn't.

MS. BRACKETT: Well, actually, that was the end of what I had to say. Those were

the five that had been stated in the documents that we would need to address.

MR. FITZGERALD: Can we do these in pieces? Joyce?

DR. LIPSZTEIN: Hello?

MR. FITZGERALD: Did you want to comment on Liz's remarks?

DR. LIPSZTEIN: I would like to. Actually, I would like to see it written all the amounts she is talking about. I think that differently from what was first presented, I think we think that there were many opportunities for exposure to this special absorption type of plutonium-238. And they were different from the ceramic plutonium from what we had seen from other data besides that accident that was examined by NIOSH/ORAU.

While we agree, we agree that probably there is a bounding model that can be developed for a special solubility type of plutonium, but we didn't see it yet. So we are waiting for one that will really be a

bounding one.

I really think the model is not an SEC question. I think that eventually it's going to be a bounding model for ceramic plutonium. But it has not yet come. So NIOSH has to show us that there is a bounding model.

With relation to what Liz is saying, I think it's very difficult to recognize the occurrence of ceramic plutonium exactly because of the delays which are patterned. So we don't know if your data may fit a chronic intake or may fit this special type of intake.

And especially when there is not much data or the results are below the detection limits, where you have very few sporadic positive data that are slightly above the detection levels, it is very difficult to differentiate between acute and chronic intakes.

So I think the scenarios that have to be compared are acute intake and granted

intakes using different types, it is very difficult to deal with all of those scenarios at the same time to find a bounding assumption to be made, especially exactly when results are very low and you have a lot of results below detection levels.

So I didn't see a reason to analyze exactly how NIOSH can handle these results. And I think that SC&A will be happy to see in the white paper an explanation of all of that so we can see that, really, it's feasible to do dose reconstruction with any model that NIOSH presents and a model that is bounded especially.

So the problems on building a correct model, I know that we have to interpret results in terms of this particular type of compound. It is not just one more because it is a question of how to interpret the data that you have as chronic, as acute, what gives a higher dose. So it's not as simple as is expressed here today.

So I think I say I would like to give credit to NIOSH to develop and to answer our questions, but we would like to have it written so that we can analyze each point that NIOSH is making.

In summary, I don't think there is too much to discuss here in this meeting, but we would like to have our white paper answered by NIOSH in a written way how they are going to handle, how they are going to do, give examples on how so that we are satisfied that, really, it can be applied to Mound dose reconstruction and that it is feasible to do dose reconstruction.

CHAIR BEACH: Joyce, this is Josie. I was going to ask NIOSH to respond in detail to the white paper. I'm hoping Brant is going to tell us about that now.

DR. ULSH: Actually, I was just going to ask if Jim Neton is on the line.

DR. NETON: Yes, I am.

DR. ULSH: Do you have any? I

mean, Joyce, when you say that you agree that there is a bounding model but you're still waiting to see it, we have presented our model in the white paper that you have responded to, you know.

DR. LIPSZTEIN: Yes. But we didn't agree it was a bounding model.

DR. ULSH: Well, it bounds 896 cases at Mound.

DR. LIPSZTEIN: Yes, but it didn't bound other cases that apparently had also the same type of exposures. The problems is that at Mound, probably there were different types of, different forms of ceramic plutonium, not just one. So each incident means a different form of plutonium.

MR. FITZGERALD: Joyce?

DR. LIPSZTEIN: But I really think it's a question of doing modeling.

DR. NETON: Joyce, this is Jim Neton.

I think Tom LaBone actually looked

at all of the cases at Mound that he could find. He could find no evidence -- Tom is on the phone, he can speak to this -- that there was a ceramic form that was similar to the one that you're citing that existed at Los Alamos.

DR. LIPSZTEIN: No. I'm saying that we found some different forms of plutonium exposure and different than the ones that were presented as type L in the white paper.

DR. NETON: You mean the --

DR. LIPSZTEIN: And the model that was presented as type L in the white paper didn't bound to two cases that we had a very big suspicion that were exposures to this kind of plutonium.

There are several urinary plots that we have presented that could look either to an exposure to this kind of plutonium or to a chronic intake. And we don't know. We don't think it's possible to distinguish between the both of them, --

DR. ULSH: All right. I think.

DR. LIPSZTEIN: -- those kinds. So they have to be a bounding type that is good for all possible forms of plutonium at Mound. Until now we haven't seen that.

DR. ULSH: Okay. I think I know what you are talking about now, Joyce. Tom modeled the 900 or so cases. And I think in your response to our white paper you presented two particular cases where you felt our moderate model did not adequately account of those two cases, right?

DR. LIPSZTEIN: Yes. Right. Right.

DR. ULSH: Tom, do you want to speak to that?

MR. LaBONE: Yes. I sent you, Brant, a little note on the 18th of May that went through and modeled case 2 from the 1960 incident. And I guess W-1 is the reference in the SC&A white paper if that's correct.

So, anyway, I went through and

modeled the two of those and compared them. And I sent that to you. And basically I think that those are fundamentally the same curves.

I don't know if you have that with you and you can show the people there what I am talking about or --

DR. ULSH: No. I'm just looking for a high-level response, Tom. I think Josie is going to task us with responding to SC&A's white paper. And that level of detail would go in there.

DR. NETON: I think that we probably would choose to send that in writing over to SC&A and present that to them. And it might actually require a technical call because I think it would benefit from some one-on-one discussions of people looking at the same set of data in my mind.

DR. LIPSZTEIN: And the other thing, Jim, you said there was no exposure to the same form that people were exposed at Los Alamos. I don't know. I think that this has

to be demonstrated also.

Jim, I really think that the modeling question is not just a question of SC&A and NIOSH to discuss. And I think the most important thing is the NIOSH to -- I think we will come up with a bounding model because I think this is something that probably can be done.

I think that the important thing is that NIOSH answers all the other questions to see that even if we have a bounding model, if this is feasible to do the dose reconstruction.

MR. FITZGERALD: Joyce, this is Joe.

I think what we have been trying to do, actually, by coming up with these events and highlighting these events for NIOSH to model is to try to look at that upper bound. I mean, we did find two cases that we thought weren't covered in the original analysis that may, in fact, demonstrate that it wasn't

bounded by the model.

That was a lot of what was in the white paper that we just gave. I think what we heard from Tom LaBone is that they, in fact, have looked at this and feel, in fact, it is bounded. We haven't seen that, but I think that would go a long ways to moving this thing forward.

I think Jim's comment about, you know, we were actually proposing a technical call on this issue for obvious reasons. I still think it would benefit from having a technical call because there are a lot of ins and outs on this thing.

I think, really, at this stage we have gone a long ways. And I don't think there is any disagreement. Conceptually I think this can be modeled.

Now, we hesitated to say it's not an SEC issue because, you know, we wanted to test whether or not it is upper bounding. And I think that is part of what we have been

doing.

DR. LIPSZTEIN: Yes.

MR. FITZGERALD: There are some application issues as well. But I think maybe the next step is to go ahead and have that technical call with the information from Tom as a starting point and see where that takes us and then maybe get back to the Work Group as far as do we think we have crossed a t or not.

I mean, it has been moving forward. I think part of this issue is just one of looking at this model and, as Joyce was pointing out, feeling confident that it is an upper bound model.

I think a lot of the testing that she is referring to we have done. So, really, I think we've moved this thing forward.

DR. ULSH: I would propose that in response to this white paper, we would prepare that, give it to you, give you some time to look at it. And then we will have a

conference call to discuss it.

MR. FITZGERALD: Okay.

CHAIR BEACH: I agree with that approach. What about the other Work Group members?

MEMBER CLAWSON: That's fine.

MEMBER SCHOFIELD: Sounds good to me.

MEMBER ZIEMER: That makes sense to me.

CHAIR BEACH: Okay.

MEMBER CLAWSON: We will get a copy of that white paper?

MR. FITZGERALD: Well, yes. It will be --

MR. KATZ: And, Brant, you will let the Working Group know about the technical call, when it is going to be held?

DR. ULSH: Sure.

CHAIR BEACH: And to be fair, I will have to ask NIOSH how soon they think that they can get that out.

DR. ULSH: Tom and Liz, you are on the hot seat here.

(Laughter.)

DR. ULSH: It sounded like someone hung up.

MR. KATZ: Tom or Liz, did you hear that question?

MS. BRACKETT: Yes. And the technical issues are few. You've got a lot of this already done.

MR. LaBONE: As far as about what the best parameters are for the model?

DR. ULSH: Well, Tom, I think what we are looking for here is you have SC&A's response to our white paper. And I would envision that we would prepare a response to that document, where we go through kind of on a point-by-point basis and examine the issues that SC&A has raised and give our take on it.

I think Liz is right. You have done a lot of the analytical work in terms of these two particular cases. We just have to

format it and then, of course, run it through the review cycles.

DR. NETON: I think that piece is probably sufficient to get the ball rolling. The other items, you know, Liz had gone through in my mind are fairly simple.

The only concern I have outstanding is Joyce's issue with chronic versus acute. It seems to be raising an issue that I thought we put to bed about five years ago.

So that may require some revisiting, but I don't know that we need to start rewriting that position. I mean, I think it's pretty clear what we're doing and why.

I think that to get the bounding nature of the model on the table, I think Tom has gotten his analyses done pretty much. We can just button that up and send it on.

And then we can reserve the other questions and discuss them point by point maybe on the call because I think most of

these in my mind, the rest of them, go away pretty rapidly.

DR. ULSH: Okay. So, Jim, you're suggesting that we just go ahead with what Tom has already proposed, have the call, and then we'll issue our response to SC&A's white paper.

DR. NETON: Well, I think so because I think the other issue that I'm hearing on the call to be addressed, from our perspective, I think we feel that they are very simple and can be answered very quickly.

I'm afraid if we put something together, we're going to say, "Well, that's not what we were talking about." I think we're missing maybe something here.

MR. FITZGERALD: What I would propose, then, is that -- it's kind of straightforward. I think what Joyce is asking for is maybe a chance to have that dialogue. Why not talk about those issues as part of the call?

DR. NETON: Right. But, frankly, I don't see us putting together anything substantive other than the bounding nature of the model. The other issues are fairly simplistic in our minds.

MR. FITZGERALD: Well, then I think we would benefit from the call. And I would just keep the paper focused on it, too, the two cases.

DR. LIPSZTEIN: Yes. And when you do the bounding model, look at all of the plots that we have presented. We presented a lot of plots of variable that could be in intake plutonium-238 from this. It could either be a chronic intake or could be an acute intake involving this ceramic plutonium-238 compound.

And your bounding model has to respond to all those plots, not only for a case that was published in the literature. So it has to be a real bounding model that would bound either using chronic or using acute or

using everything. There must be something that --

MR. LaBONE: I'm not sure. We might disagree there. We can talk about that more on our call.

DR. ULSH: Okay. So I will send over to you the little piece that Tom has prepared. Joe, how about you and I then will get together and discuss it when it makes sense to --

MR. FITZGERALD: Yes, right.

CHAIR BEACH: That works for me. Is everybody in agreement to close or not to close but actually to --

(Laughter.)

CHAIR BEACH: Sorry. Misspoke. I think it's lunchtime.

MR. KATZ: At the end of that, after the technical call, then there will be a memo or something from you to the Work Group about where things stand for the focus group.

CHAIR BEACH: Right.

DR. NETON: Sounds good.

CHAIR BEACH: So let's take an hour lunch break. It's 12:30 now. And reconvene at 1:30.

DR. LIPSZTEIN: One question. Are we going to go back to plutonium or not?

CHAIR BEACH: I believe we are going to wait, Joyce. Unless you have something else you want to discuss, we are going to wait until the technical call.

DR. LIPSZTEIN: Okay. Thank you.

CHAIR BEACH: Okay.

DR. LIPSZTEIN: That's good for me.

CHAIR BEACH: Thank you, Joyce.

DR. LIPSZTEIN: Thank you.

CHAIR BEACH: Okay. Lunch.

MR. KATZ: Okay. So we'll be back on around 1:30.

CHAIR BEACH: Around.

MR. KATZ: Around 1:30. Thank you, everyone on the line.

(Whereupon, a luncheon recess was

taken at 12:29 p.m.)

A-F-T-E-R-N-O-O-N S-E-S-S-I-O-N

(1:36 p.m.)

MR. KATZ: This is the Mound Working Group of the Advisory Board of Radiation Worker Health. And we are just reconvening after a lunch break. Let me just check on the phone.

Dr. Ziemer, are you with us?

(No response.)

MR. KATZ: Let me check. Is there anyone on the line who can hear us?

DR. NETON: I can hear you, Ted.

MR. KATZ: Okay. Great, Jim. So Dr. Ziemer again?

(No response.)

MR. KATZ: Okay. How about Bob Presley?

(No response.)

MR. KATZ: He never made it yesterday.

CHAIR BEACH: Yes.

MR. KATZ: Okay. Okay, then.

CHAIR BEACH: Okay. So we will go ahead and get started with our agenda item, "Radon issue number 2." And SC&A is going to take the lead on this.

MR. FITZGERALD: Well, I think I will get the background. And since NIOSH has been, I guess, the last round issued a white paper, maybe they can explain what the white paper says. And then we can go from there.

CHAIR BEACH: Sounds good.

MR. FITZGERALD: Okay. Really, as far as background, in the ER, there was a reference to, frankly, radon values in various buildings during Mound's history.

And the concern we expressed was a particular location, the SW building, where there essentially was one radon value that was highlighted. And that did not address the limited measurements before the events.

If you can imagine, this was a laboratory space that was constructed over where the old cave at the Mound was located.

And they had an individual who exhibited elevated lung counts. And they thought it might be Pu perhaps contamination.

They were concerned. They traced it back and I think established that there was a potential for exhalation of radon into his space. And they did a grab sample and found a fairly elevated flow of radon into a space. And his desk was right by the hole to which the radon was apparently coming through.

So they did at that point in time, one point in time, a grab sample, established radon flow. They did some monitoring in the tunnel underneath and pretty much established that this individual had elevated counts, probably due to that, and proceeded to come up with certain control measures, proposals, and effectively ran a vent to the underlying tunnel and were able to mitigate most of the radon.

So, really, after 1980, much of that issue went away. But before '80 and

after the SW complex was built, there's a period of time where clearly radon, elevated radon, levels may have been implicated.

So we had raised that issue from that standpoint and also noted that a confounding issue was there were other radon isotopes, actinon and thoron, that were apparently present in appreciable quantities based on this one sampling they did on the tunnel.

And our point was with only effectively the one sample that was taken, we didn't believe that was a reliable characterization of how much radon exposure; in fact, workers in this particular area, were being exposed to. That was, again, some time ago.

In response, NIOSH indicated it found quite a few records from an earlier period that would be relevant to the issue. And that was the core of the white paper that came back, a method to apply that data.

I'll leave it to Brant to walk through the white paper or Don to walk through the white paper that we just received.

MR. STEWART: Sure. You know, first of all, we don't have radon data for every year. So what we are attempting to do is to bound this with the large measurements that we have found.

What we found was when they began the old cave operation, they had spread airborne contamination on an unprecedented scale.

In fact, that led to the early termination of that process, early remediation of the cave. So they had intended to use it for other activities but found that wasn't tenable given the large amounts of alpha contamination in the air. So radon was a continuing problem for this.

After they terminated the process in '54, they took some mitigation measurements to clean out the operation. And they kept

finding it wasn't all that cleanable. And they actually ended up four years later completely disassembling the facility and capping it with concrete.

That room went from being SW 1A to SW 19 at some point. It was a laboratory that was built on a cap over the old SW 1 building. But being porous, of course, they still had a radon problem there.

The data we have are the values. Once they saw that they had this issue, they began keeping track of short-lived daughter products in the air. And we used those data, compared those, and simply just took the largest we could find during the era of operation and considered that a bounding dose.

We have one measurement that actually separates the concentrations into the reconstituents thoron, radon, and actinon. So we used that to go back and set up ratios, proportions year by year for those values. And we assigned working-level values based on

those calculations.

CHAIR BEACH: So, Don, those are based on one sample?

MR. STEWART: What we used was the largest measured value for short-lived daughter products in the air in the operational period of the old cave. And the old cave I think we picked that because we thought that that would surely be a bounding scenario.

The material that was used in the old cave was largely composed of thorium and had a very high radon emission rate.

MR. FITZGERALD: Don, you may be referring to the sample that broke out the different isotopes.

MR. STEWART: Yes, a single sample.

CHAIR BEACH: I thought you had mentioned that. I just wanted to make sure I was clear.

MR. STEWART: Yes. What they had was they had a -- there was a ventilation

tunnel underneath this room that stayed intact.

CHAIR BEACH: Right.

MR. STEWART: And that was kind of the worst case scenario as far as their measurements went, very, very high working levels in that room.

CHAIR BEACH: Right.

MR. STEWART: People weren't in there breathing that, but we thought that was the only data point that we had to establish the mix of radionuclides of the different isotopes of radon after that.

We just back-calculated it. We assigned working-level month dose values by year. Assignment, individuals were assigned to R and SW buildings. And that's the approach we took. This would be implemented in the TBD when the internal part of the TBD is revised.

Brant, did you have anything to add on that?

DR. ULSH: Just that I think that issue that Josie asked about that one sample that was used to split out the overall sort of daughter products and used that grab sample to split those out, I think that's a claimant-favorable approach, right?

MR. STEWART: Yes.

DR. ULSH: I mean, it would be a concern if we used one sample, as opposed to an approach that was not indicative.

MR. STEWART: Yes. I think claimant favorability arises from this is where the stuff is coming. This is closest to the emanation point that this could come. And those values are going to change drastically as the source is diluted in a room. The short-lived species are going to die off.

So that is a claimant-favorable -- I should have studied up on this a little bit. It is claimant-favorable to assume those concentrations persist in the working environment; whereas, the bad actors are going

to drop out fairly rapidly compared with the radon-222 because they have a shorter half-life.

MR. FITZGERALD: Don, spatially I think you're quite correct. That is fairly close to where the workers would have been exposed to the relative concentrations of the isotopes.

MR. STEWART: Well, workers wouldn't, in fact, be exposed in this area because it's --

MR. FITZGERALD: No, no. I'm just saying it's as close as you can get. That sample was taken --

CHAIR BEACH: So you took the sample in an area but not the area the workers were actually working in, the tunnel?

MR. STEWART: Yes, the tunnel itself, where the --

CHAIR BEACH: There are two separate areas. It was two separate areas. It wasn't actually where the work was being

performed?

MR. STEWART: Right. That's correct.

CHAIR BEACH: I'm sorry for interrupting, Joe.

MR. FITZGERALD: Well, no. My question -- I don't disagree with your point on that one, but we sort of got into this issue because we only had one sample prior to '80 that was actually the sampling of the concentration with the radon.

I was wondering, would there be any variability in your splits given the fact of just one sample? Do you think that would be likely the most favorable split? I don't know.

MR. STEWART: The most favorable split?

MR. FITZGERALD: Well, I'm just saying, is that a representative split?

MR. STEWART: We're not really in a position to say that it is or is not. I would

say it would tend more to claimant favorability that close to the emanation.

DR. ULSH: I would say the answer to your question is that no, it's not representative because it's closer to the emanation point than actual workers would be.

So what is the effect of that? Well, it's an overestimating assumption. So is it representative? No. It's overestimating.

CHAIR BEACH: Is it plausible? I mean, could the workers have actually gotten that dose?

DR. ULSH: It doesn't result in doses that are implausibly high. It is certainly overestimating.

MR. STEWART: Yes. Radon, what is high with radon? I've asks the question, that question, to this group before. What is high with radon? Is compensable high?

Because, you know, basically any time we apply these values to a lung cancer

claim, it's a compensable case based solely on radon.

DR. ULSH: But most lung cancer claims are already paid anyway.

MR. STEWART: See, what happens, radon, probably a causation calculation is very sensitive to the radon input. You could put in even a fraction of a working-level month and see a significant -- sorry -- fraction of the working level per year.

That's how you put it in and see a very significant increase of probability causation such that currently the value recommended in TBD is ten working levels per year.

And so you put that value in. So I said, "Okay. Where does it stop being compensable?" And the cases that I looked at were hypothetical runs, you know, one year of employment, no external dose, no other internal dose, only do radon dose.

In some cases working on an annual

working level of three is non-compensable based on a short latency or some other periods. But when you start to get up into that ten category, they're all compensable. So it's a pretty high number.

CHAIR BEACH: I guess I need to know a little bit more about the sample. How was it taken? Was the instrument calibrated? Because you're basing a lot on one sample if I'm getting hits correct.

DR. ULSH: Well, not really.

CHAIR BEACH: Oh, really?

DR. ULSH: In terms of determining the concentration of the short-lived daughter products in air, we have -- Don, would you say thousands?

MR. STEWART: I'm sorry?

DR. ULSH: The short-lived daughter products in air, how many data comply, thousands?

MR. STEWART: Yes. We had a lot of data. I think there were about 2,000 lines of

data.

DR. ULSH: So, Josie, the only thing that we used that one sample for was, okay, we've got these short-lived daughter products, radon-222. Some of it is actinon. Some of it is thoron. How do you split out that gross measurement into those three subspecies?

The way that we have done it is we have taken the sample, a grab sample, that was closest to the source, which is going to be the most limiting case, the most claimant-favorable case split out of those three.

CHAIR BEACH: So did you have other samples that you could have chosen from or did you just have that --

MR. STEWART: We have a single data set, just that one single --

CHAIR BEACH: Just that one? Okay.

MR. STEWART: Well, it was during the detailed radon study that was conducted as

a result, as was said earlier, and the technician actually undertook to measure the proportions, we don't have any other data for that. At least that is the earliest data.

DR. ULSH: But the point is you could make other assumptions in terms of other splits of those three and it wouldn't make much difference. I think it could even be less, it would be a less claimant-favorable assumption.

So that would bring up the question of, well, is this implausibly high, which is what I think you asked earlier?

CHAIR BEACH: Yes.

MR. STEWART: And that is kind of a point that we have been making all along, that once you get to a certain point, it doesn't matter if it is 10 times higher or 100 times higher. But it's also a fact that there were some very high radon concentrations at Mound.

So the fact that we have got three-quarters of the lung cancers paid

anyway, I think the values that we're proposing were certainly based on radon values that were observed at Mound.

So in that sense, they're not implausible. However, it is certainly overestimating. At least that is our contention. Because the values that we have chosen were during the active operational phase when that project was going on.

Once that project ended, up until the time that they did the remediation that Joe described, our contention is that certainly the values were not higher than what we were observed during the operation phase.

MR. FITZGERALD: But just to recap, I mean, it sounds like what you are saying is that, even if this wasn't a single grab sample, this is almost like a sensitivity thing. You really couldn't adjust those isotopic, relative isotopic, activity levels proportionately that would give you much of a difference as far as the end result of dose.

MR. STEWART: That's very likely.

DR. ULSH: If we did, it would be lower. How much lower I don't know.

MR. FITZGERALD: Because that was missing from the white paper. And I realize it was just that one grab sample. So I was wondering. You know, who knows what it might have been the next time that -- went down and sampled a tunnel. And whether it would have been a different result that would have affected the end result or not I don't know.

MR. STEWART: I would have liked a robust data sample to use to determine that. Then we could determine the sensitivity of the final doses to that. (***PART 5, 1:53:27***)

DR. ULSH: Well, it can't be any worse than all of one of the three species.

MR. FITZGERALD: The upper bound would be the -- right. It couldn't be any worse than all of that.

MR. STEWART: Yes, you could do that.

MR. FITZGERALD: I'm just saying that if there were more than one sample, I guess that's better. But with just the one sample, which got us into this in the first place, --

MR. STEWART: Sure.

MR. FITZGERALD: -- you're saying subjectively you don't think it's going to make much of a difference.

MR. STEWART: In terms of the proportion of compensable cases, it will make zero difference.

MR. FITZGERALD: Is that the benchmark? I think the benchmark is dose reconstructability. I mean, would it make a difference as far as giving you a different benchmark.

MR. STEWART: Well, you know, they said it was going to be large.

MR. FITZGERALD: Yes.

MR. STEWART: You know, measurement may have been 1980 was large.

MR. FITZGERALD: Yes.

MR. STEWART: So given the sensitivity of lung cancer patients to radon inputs, it's inescapable that any radon dose that we assign is going to have very large --

CHAIR BEACH: Well, what about the time period? When was the sample taken? Was it at '79 in the winter or are you using that data for what time period?

MR. STEWART: We are going back to 1949 for the R building and 1952 for the SW building. And we are using that. We are projecting that measurement back that far.

However, we are decay correcting, the different parent radionuclides there. You know, these are thorium, actinium, and radium. There have to be those things in the soil that are causing these things to emanate.

So the proportion of those is going to change over the years. So what we did is we took this sample here and said there is this much iridium, this much thorium, and this

much actinium. But in 1949, there would have been this much actinium, this much thorium, this much iridium, done that year by year and use that to balance the radon concentrations by changing the proportions of the daughter products, the radon, actinon, thorium.

DR. ULSH: Think of it like a pie chart with three different slices of pie. One slice is radon. One slice is actinon. One slice is thoron. You could change the size of the slices of pie, but the pie remains the same size.

CHAIR BEACH: I guess I wonder if you didn't have that one grab sample how you would assess that dose or if it would be possible.

MR. STEWART: At that point we would likely have assessed the most claimant-favorable. It wouldn't have been too far from what we --

CHAIR BEACH: Right.

MR. FITZGERALD: Okay. Well, I

think that's sort of a question. But the larger question -- is Jim Neton on the phone?

DR. NETON: Yes, I am.

MR. FITZGERALD: Yes. Okay. This is going to be a familiar issue. And I was hoping you would be here.

I guess my question on this -- and I think we have sort of got to the point where we looked at all the data that was available and probably done what we can.

This is sort of reminiscent of sort of the surrogate data question. And sort of get your opinion because, really, there is one sample point for pre-1980 radon or SW-19. We've got that one value. We have a number of values after 1980. That's where this issue had come from for SW, the lab space.

And the approach that I think I am hearing and reading is that we are going to go back to the old cave in the '50s and pick radon concentrations which clearly are very high, meaning that there is no question during

the operations of the old cave. We had some very high radon concentrations.

But the exposures we're addressing in the '70s, say, or certainly the time frame we're talking about were post-D&D. The cave was bulldozed, well, D&D first, bulldozed over and dope over. So you had a number of things going on.

I guess in my opinion it's sort of like a surrogate data question, meaning the facility we're talking about, which is the office or lab space that started this whole thing with the individual involved and the exposure potentials to the occupants is not the same as this SW cave in 1954 and '55 that we're using radon values from.

I mean, they are certainly bounding, but I guess I think they're implausibly high. I just don't see how one would expect to see those same values.

I think certainly I am trying to follow this surrogate data debate. I think

the notion there was that there is a justification for applying data from different time periods and different configurations. I think we're sort of in that situation of having to justify applying values from different time periods, which are from a different source, which I think in our opinion may be implausibly high.

You know, we don't get into a situation often where we're saying, "Look, it's almost too extreme." In this case I just don't think the operations are the same and the values are going to be much higher than we would have expected the individual to be exposed to.

I just want to open that discussion up because I think that's really the one thing that comes to mind seeing this approach is that issue. What is your opinion on that?

DR. NETON: It's surrogate data not in the sense of from another site, but it is from another era. I honestly have not been

involved in this enough to put a position forth right now, but what I think I would like to do is go back and look at this in light of what IG-004 said, which is our paper on the use of surrogate data and what conditions need to be met.

I don't know that this is necessarily a bad approach or not. I mean, it sounds like there are very good reasons why it is a bounding value.

But I think you're right. I would like to take an opportunity to go back and look at it in light of the IG-004 of procedure or policy.

DR. ULSH: I would like to bring a little perspective into this. I mean, keep in mind that the radon concentrations at Mound were so high that they deemed that it was appropriate to remediate for it. And it doesn't take much radon to put these all into compensable range anyway.

DR. NETON: What I'm hearing is

that these concentrations are somewhere on the order of one to two hundred picocuries per liter. Is that sort of a rough guess?

MR. STEWART: Well, we ended up with them in working level months. And they range from 12.2 working level months to about .1.

DR. NETON: It's about an average of a working level in -- I mean, a high of a working level, which with 50 percent equilibrium could be as high as 200 picocuries per liter, a rough number.

MR. STEWART: Yes.

DR. NETON: The other thing is that it's a little bit misleading that small amounts of radon can produce a very high compensability rate. But I think, as I discussed at the last Board meeting, there's this time sense exposure, which is an exponential function in the risk model that rapidly decrements the risk after the exposure stops.

So, for example, if a person quit working in '58 and developed lung cancer in '98, they would have to have very, very high concentrations of radon to get a PC close to 50 percent.

I am not sure those arguments really should come into play here anyway, but --

MR. FITZGERALD: Yes. I think the IG-004 is the one I am kind of concerned about. I have an excerpt because I wanted to make sure I -- because, again, I haven't been as close to that as you and some others have been.

The piece I thought applied from IG-004 was when a bounding exposure model is developed using surrogate data, the upper bound must be plausible. That is, it must be realistically possible given the nature of operations at the facility being modeled and other relevant factors.

While it's not possible to provide

fixed criteria for evaluating plausibility, certain reasonableness tests can be applied. And there are a number of examples.

Just in this case, since we don't really have any useable data, we do have some -- we have one sample, I just don't think the conditions inside of the cave at the worst point in its history is the same as what this individual might have been exposed to in, God forbid, the office or lab space in SW. I just think those are two different conditions. So that is certainly the concern that we have on that.

DR. NETON: I guess I need to know a little bit more about the other sample that we didn't use. I mean, it sounds to me like there were a lot of samples and we chose its high value for some reason.

MR. FITZGERALD: Those are the samples in '54 and '55. In the contemporary with the exposure period of concern, there was one sample that was taken. And that is what

got this whole thing started because --

DR. NETON: I see. I see. Yes.

MR. FITZGERALD: And I think Brant is --

DR. NETON: We'll have to go back and look. And I have no idea where it talks about similar operations and going back. I really think that we owe it to the working group an analysis of why this is an appropriate value to use in light of what IG-004 says. I think that should probably be an action item for us if it isn't already.

MR. KATZ: Jim, if you don't mind, let me just add a remark, too, because it has come up in a number of statements now about plausibility. And I understand where you just noted it with respect to IG-004 plausibility level.

But, just to go back to sort of the foundation document, the SEC rule, what it says about plausibility is that your circumstances have to be plausible. And

surely your doses are reflective of the circumstances.

Some of the conditions of circumstances that you model have to be plausible. So there is a distinction there versus arguing that the dose level itself is plausible, it's like you have to consider circumstances that are plausible. I mean, that relates to what Joe said, certainly.

DR. NETON: I think they kind of go hand in hand. I mean, if circumstances are plausible, they have reasonable doses that are bounding.

You know, what I think IG-004 was trying to get at, you know, you don't produce doses that are lethal or could cause scar damage to the lungs or something like that, you know.

The idea is you just can't put a bounding number up there to say it's bounding and it had to be some ridiculously large value that it requires some deterministic effects.

You are absolutely right. The SEC regulation speaks of it in different terms. So, anyway, I think that we should go back and look at this in light of that and just see what we think.

I am not suggesting that it is an inappropriate value, but I think it would be good for us to go back and document why it is indeed appropriate.

CHAIR BEACH: And then no question on using it to break out the three different pie charts, as Brant explained. That is not a question that's on one single sample.

MR. FITZGERALD: Well, I think what I hear is that there is a way to demonstrate that that is bounding, but it hasn't been -- you know, I haven't seen anything, really, on that other than the fact that that is what it is based on.

So it might be useful just to get something that explains why that would -- not just simply -- I don't think there are any

disagreements. It's worker claimant-favorable because it is taken downstream close to the room. I think the question is, is one confident the split is claimant-favorable itself.

DR. NETON: I guess my question was -- and I don't want to lengthen this too much longer, but if there was thoron in that room as well, are we finding these working levels of radon-222? Is that what I am hearing?

MR. STEWART: We're assigning working levels of each.

DR. NETON: Oh, of each? Okay. So we do have working levels of thoron and radon.

MR. STEWART: And actinon because actinium-227 is in the soil. So each one of those will be included.

MR. FITZGERALD: Yes. The difficulty that we have is that in 1979, one series of samples is taken in the workplace and one grab sample taken from the tunnel. And the sample from the tunnel is where the

analysis is split is taken from. And it's just one sample.

DR. NETON: Okay. I need to know more, I guess. I'm ignorant on this at this point. So I will shut up.

CHAIR BEACH: Okay. So for the work group, so NIOSH is going to re-look at this issue. Jim Neton wants to review some document.

MR. FITZGERALD: Just those two issues.

CHAIR BEACH: Just those two issues. And then you will get -- how will you report that back to the work group? In a memo? Well, we say white paper. We know that's a huge -- I mean, we can get at it with this document. So just a memo, I guess.

MEMBER CLAWSON: There should be some document so that we have something to come back to.

CHAIR BEACH: Well, it is kind of interesting work on that. Thank you very

much, Ted. The plausible issue is very important and how you explain that kind of circumstance.

Okay. So anything else? Any other questions, comments on radon?

Okay. Then if we're all ready. So the next item on the agenda is exposure to non-rad buildings. And that would be issue 17. NIOSH is going to take that one.

DR. ULSH: This issue was presented under matrix issue 17, which I believe dealt with external dose badging policies more or less.

The first I think written piece that we have on this is SC&A's report, I think, written by Bob Alvarez, where he looked at four buildings, D, S, M, 48 --

MR. FITZGERALD: I think maybe we should step back.

DR. ULSH: Oh, go ahead.

MR. FITZGERALD: I think we got into the discussion, additional discussion on

badges most exposed. And I think there was agreement that there isn't any documentation or documented badging policy to point to. There's no way to really resolve the history in that regard.

I think it was proposed -- and I just can't remember by whom -- that maybe there is a way to test the hypothesis by looking at ostensibly -- and I've got to throw that in -- ostensibly non-radiological buildings and see if, in fact, they may have been frequented by non-badge personnel. And I think that's where that came from because we were on the badging issue because then we shifted into this sort of test.

DR. ULSH: And so I think the point of SC&A's white paper -- and I know you will correct me if I am wrong -- was here are four buildings which SC&A has said had been classified as non-rad buildings, where there was -- those aren't my special effects, I promise -- these four buildings, which SC&A

classified as non-rad buildings. And then they presented examples of radioactive material in these buildings.

And so I think the question was then, well, if these are non-rad buildings, did that mean that people weren't required to be badged but, in fact, there was radioactive material in them?

And so that might be an example of a situation where people could have been exposed externally but not badged.

MR. FITZGERALD: Yes. And this became a little bit of a point of contention. These were ostensibly non-rad buildings because, again, they were identified to us as four candidate buildings that were seen as "non-radiological" but may have had radiological materials, which sounds like a non sequitur. But in a sense, that was the way to perhaps test the hypothesis.

DR. ULSH: So it was never really clear to me what the source of those

classifications as non-rad buildings was.

MR. FITZGERALD: Yes. That's what I'm saying. It's a little fuzzy on who recommended those four buildings. They were recommended as four that we should look at. And we did.

DR. ULSH: There was D, S, M, 89 --

MR. FITZGERALD: Yes. I have it here.

DR. ULSH: And 40 something.

CHAIR BEACH: Forty-eight.

MR. FITZGERALD: Yes, 48 I think.

CHAIR BEACH: And M. It was M, 89, DS.

MR. FITZGERALD: Right. Forty-eight, 89, M and DS.

DR. ULSH: Okay. So kind of the thrust of our response to that paper was to question the basis of SC&A's belief that these were, in fact, non-rad buildings and will, therefore, present an example of the kind of situation that we're talking about here

because I think we presented a number of documents where they were not considered non-rad buildings.

And our main point was that there was no evidence that there were workers in these buildings who were not badged. And, furthermore, the citation of some contamination levels I think largely during the D&D era but there might be others as well do not in and of themselves demonstrate a significant exposure potential.

Bryce Rich, are you on the line?

MR. RICH: I am.

DR. ULSH: Okay. How about I turn it over to you, then, to fill in any blanks I might have left or --

MR. RICH: Sure. The definition of -- well, first of all, there are a number of perceptions that were introduced, I think, as a result of this paper. And I would like to just, if I could, briefly go down to those perceptions and in so doing perhaps address

what we have come up with.

The SC&A white paper suggested that the work group may want to direct the exposure pathway primarily between T and DS be examined and also if there is sufficiency of data to support dose reconstruction for all four, for 89 and the DS.

We have done due diligence. Leo Faust and myself are both permanently cross-eyed from reviewing records. And our white paper, of course, presents our response.

We used primarily the references that were listed in the SC&A white paper and address from our response from a different basis. There is a myriad of additional references dealing with previous operational history and all that we could give you a good if you like it, but they are voluminous dealing with things like operational safety reports, routine safety reports, going back to '49 and forward.

First, if we could just talk about

some of the misconceptions? First of all, the rad/non-rad perception would perhaps lead to a perception that there wasn't any radioactive materials in the facilities and consequently radiation safety concern or attention.

This coupled with the fact that a series of pre-D&D surveys -- and I would like to talk about the difference in the type of surveys -- indicated that there was legacy contamination in all of these buildings.

And that would lead to through the misperception that there weren't any radiological protection programs to protect workers that were in these facilities during the period of time when the contamination was introduced.

I would just like to say that non-rad was not a facility descriptor. They used the terms "high hazard," "low hazard," and "clean." And all of the records of their routine reports referred to those designators and listed a number of swipes and a number of

other evidence of radiological protection programs in force in those categories.

It is interesting to note that the clean facilities had less than ten percent of the number of sites that were listed for high hazard, which it expects about a site a little bit less than that.

Another general perception that I would like to visit applies directly to Mound, I think. And that is that I think there may be a perception -- and I pick up on that from various comments made by the Board and others -- that the early years' radiation protection programs were remedial or they were certainly not advanced and the results more suspect in later programs.

I would like to just indicate that my own personal/professional health physics experience at the applied level goes back to January of 1953, when I first entered the health physics programs.

During that period of time, there

were a lot of programs, facilities being introduced for the first time. These were R&D programs, the introduction of one-of-a-kind operations, and a variety of things.

I was really impressed, even during those very early days, that the radiation protection programs were mature in their comprehensiveness. For example, at Idaho, they had master's-level health physicists who were actually doing the field survey work and fundamentally because of the fact that in a lot of cases, the processes and the facilities were the first out of the box.

And so I see evidence of that at Mound also. As you look at the reports, the confinement barrier monitoring surface contamination, personnel contamination, air monitoring, radiation detection, plus the fact that, even in those early days, they had what we call CAMS, or radiation air monitoring systems, that were alarming constant air monitors.

They wouldn't be placed in all areas but primarily at the confinement barrier for process materials so that you get an immediate alert that a confinement barrier has been breached.

Those instruments were in place at the very front end of the radiation protection experience. And we see evidence of that as we review the records at Mound.

In the early years, Mound, the programs are facility-specific, rather than site-wide-specific. In other words, the radiation protection programs, although covering the comprehensive nature of the control programs were different, the selecting program and how they handled the materials was different facility to facility.

They all covered the same operational concepts that in the early '80s primarily due to change in federal regulation where it specified radiation work permit basis -- these operational philosophies, by the way,

covered the same thing that would be covered under a radiation work permit.

Control of the radiological hazards was by key. The facilities, the laboratories were locked. And only those that had knowledge and responsibility for controls had keys to the facility. This is both from a security standpoint and a radiological protection basis. The procedures for control of those, each of these facilities, was posted in a unique posting at the top of the doors.

A little bit later on they changed to a radiation work permit, in which it was then they didn't have to retrain the technicians when they sent them to different facilities. They had a consistent radiation work permit across the site.

But the point is that from a perception ratio, there was a comprehensive program in place right at the start of the program in '49, about as far back as we had gone.

Perhaps one of the other conceptions or perceptions that is listed deals with the location of the DS facility on top of the T building, which is one of the first process facilities built in 1948, an unusual facility in the fact that it -- the description is on page 9 of our response. It had 17-foot-thick heavy, reinforced walls, 8-foot ceilings, effectively a 10-foot floor, built below ground, no windows. It was a self-enclosed. It was designed to be bombproof, 2,000-pound penetrating bombs.

About 20 years later, then DS was built using the T building as a construction base. It didn't share any of the utilities. And certainly there was no interaction.

In order to get from T building to DS building, you had to go outside and then up a berm and then back in the DS facility. We note also that in the SC&A paper that the listing of the total effluent in the hundred of thousands of curies per year discharge

through the stacks, that's to indicate that there is a lot of effluent, T building being one of the primary facilities.

DS was no more susceptible to that effluent than any other facility on site because the discharge went up a 200-foot stack. And those numbers were monitored with a stack monitor. There was no interchange between T and DS.

Maybe we could talk a little bit about the type of surveys. It is standard complex-wide standard operating procedure that you have routine surveys to check for contamination or a breakdown in the confinement barriers of the process, where your process material is involved.

All of these facilities, so-called non-rad facilities, which we would say would be low-hazard or clean facilities, were on a routine survey list. Those surveys were probably infrequent because of any material that was taken into DS, for example, would be

under the guidance and support by radiation safety, but routine surveys were done.

But routine surveys were only to look for major issues; for example, survey the doorknobs and traffic patterns. And if there is anything detected, then, of course, you would return to look for what the source was.

That program was in place. It's in the routine reports through the years. The pre-D&D survey, which was done in the late '90s and early 2000, serves as the basis of concern, I think, to indicate -- well, even indicate perhaps we ought to cover building 48, for example.

There's precious little contamination from the legacy standpoint that's even there. But even its history would indicate that it was a facility that was known to handle radiological material.

The only one in the past that was designed to develop radiological material was building 89. That was built in 1985. It was

primarily designed to store detonators that would be analyzed in building 48. That one, there are a couple of pieces of equipment that had fixed contamination.

N building was actually a process building. It was a machine shop and housed all of the crafts people. All of us people would have, even in the early days -- uniform badging for everybody only occurred in the -- well, about 1987, I think.

But even before then, people who were involved in process buildings or had access, need for access, to the process buildings were given personal dosimeters. And it was on a select basis at that time.

So I think, just even from the D&D, pre-D&D, survey, we see no evidence of the fact that there was any material there that would cause any degree of concern.

DS is the main one, primarily from the standpoint that there were a lot of surveys, a lot of contamination indicated.

And the listing of one of the sites, which indicated tritium of a couple of million disintegrations per minute on the slide, if you look at it carefully, that was in a green storage cabinet.

The history of DS, we find that it was known to be a facility in which radiological materials were handled. And, as I indicated, this handling was done under the control of not only the management.

This was a metrology laboratory. The people involved in this would actually go to the operating area, then also bring equipment or tools or whatever back to the DS facility. The standard practice was to involve health physics.

We interviewed a long-term health and safety manager. He said in the '80s they had become a little bit lax in actually calling for support, I think primarily because when you do a lot of operations and you don't have any problems, you get a little bit

casual. And that was fixed.

And so the standard operating procedure was reinforced, again. We have every evidence of the fact that any contamination that was handled or brought into the facility was not being processed. They weren't doing process work with unconfined radiological material. It was primarily pieces of equipment like electronic equipment that would be in for calibration or tools or other equipment.

Standard operating procedure is also as you released these tools, pieces of equipment for evaluation, that they be surveyed at the points in the operating facilities.

As they did that, of course, DOE operating procedures did allow for fixed contamination or particularly in electronic equipment and other things of the kind, where it's almost physically impossible to clean all of the circuit boards and everything else

completely, could be handled under direct control, which was done.

So in all of the operating reports, we see that DS was known as a facility that handled radiological materials with the admonition that before it was D&D, it would require a thorough survey.

The D&D survey if you are familiar with MARSSIM, the survey that converted some survey system that means putting off a facility -- I don't think the survey, the pre-D&D survey, was done to that degree, but it was done with the same purpose of assuring that there was no radioactive material in these facilities that was to be D&Ded that would result in the release of debris to the public or to landfill that had significant or detectable, for that matter, contamination.

MEMBER CLAWSON: Hey, Bryce?

MR. RICH: Yes?

MEMBER CLAWSON: This is Brad. Didn't they release some equipment that they

had to recall back, though?

MR. RICH: I'm sure that that's true.

MEMBER CLAWSON: Part of the thing is, too, you know, we've got a lot of employees that were not really badged. And this even went on in the earlier years. They kind of badged per facility, didn't they?

MR. RICH: They badged by facility, fundamentally by the operation.

MEMBER CLAWSON: And I understand this. Part of where this came from was from electricians and so forth, some other people that were designed that basically were not assigned to a facility per se but they were actually ending up going in the back way of the buildings pulling wires and so forth like that, but they weren't badged, I think is where a little bit of this comes from.

MR. RICH: Normally the operating procedure would be that anybody that had access to radiological controlled areas would

be controlled to the procedures that were established.

MEMBER CLAWSON: And I understand that part of where this came from was that in the back of some of the radiological buildings, they weren't really set up for it, but that's where a lot of the power and so forth came into.

And this is where some of the electricians and so forth came into that. And this is what kind of raised some of this question because you're right.

Per procedure going into the -- I guess what I would say, the front end of the building, they were badged and --

MR. RICH: And it's a controlled facility, Brad. Pardon me. As you went into areas where the material was being processed, in a glove box or whatever it might be, then there were strict control procedures, including dressing out and procedures for surveying it as you crossed the boundary.

MEMBER CLAWSON: Okay.

MR. RICH: Now, there were, of course, their vent lines and cable chases and others that became contaminated. The process was that any time you worked on the facility, that it had to be surveyed before it was released for work.

I can't say that there weren't specific examples when those procedures were not followed exactly.

MEMBER CLAWSON: Right. And I understand that. And this is part of the reason why there were modifications later on to part of the working procedures, because they actually pulled cables from inside of the facility out, which brought the contamination out through that, the cables. And that's part of where the issue came and arose from.

MR. RICH: Obviously that is a mistake. That resulted in an incident and brought a lot of attention that caused the operating procedures to be changed in a

facility, which people do things that were contrary to good sense.

But normally those incidents occur and draw a lot of attention. So it's not a matter of not being able to be aware of and need for additional bioassay analysis and what have you.

DR. ULSH: Okay. But, Bryce, I think the question Brad or the situation that Brad is bringing up kind of gets to the heart of the issue.

And that is it seems that in SC&A's white paper, they are equating exposure to various levels of contamination, some of which on paper appear to be quite eye-popping, there are big numbers, equates to the need for external dosimetry.

And I think is a misconception. That's one of those misconceptions --

MR. RICH: I think that's been modified, Brad, to include internal, as I recall from reading the comments on the Board

before. And we looked at it from that standpoint, the need for external.

And, frankly, there is no need for external based on what was handled in any of these facilities except for whether they were doing machining of uranium and other things.

In those cases, they would be badged appropriately. However, what was handled in DS was, you know, there was functionally no external exposure.

And then, of course, the real issue that appeared to be of concern was the fact that the contamination surveys, which were the exhaustive, extensive surveys prior to D&D of the facility, are to document the conditions in each one of these facilities prior to D&D. Those showed a number of, 30 to 40 percent of, the rooms had detectable spots of contamination in D and S.

And so we proceeded from that standpoint. What you mentioned, Brad, is exactly right. If you look at the -- and we

have these addressed on page 6 and others. The smearable contaminations, even from a potential internal intake standpoint, are functionally of little concern. The smears themselves would indicate that.

CHAIR BEACH: Bryce?

MR. RICH: If you look at the smears also, there is one smear that was 2 times 106. And that was tritium.

CHAIR BEACH: Bryce, this is Josie, the work group chair.

MR. RICH: Yes?

CHAIR BEACH: If you don't mind, I would like to interrupt you. And I have a question for SC&A based on the white paper that was presented to the Work Group in April.

Have you had a chance to review? Do we need to take some time to review that white paper?

MR. FITZGERALD: No, no. We've had a chance. I want to give Kathy the one chance to comment. And then I think we can maybe

wrap this as far as where we are coming from.

CHAIR BEACH: Okay. So, Bryce, if you don't mind, I am going to let SC&A speak for a moment.

MR. RICH: Sure.

MS. ROBERTSON-DeMERS: I just had one problem with the NIOSH response.

CHAIR BEACH: Can you speak up a little?

MR. RICH: Yes. I can't hear you.

MS. ROBERTSON-DeMERS: I had one problem with the NIOSH response I just wanted to point out. Perhaps it just needs to be removed. That was a statement made that after 1987, all personnel who entered the control area wore personal dosimeters and were subject to routine internal monitoring.

CHAIR BEACH: Was that in the ER or --

MS. ROBERTSON-DeMERS: That is on page 6.

CHAIR BEACH: Page 6 of the --

MS. ROBERTSON-DeMERS: Of the white paper.

CHAIR BEACH: -- of the white paper. Okay. Thank you.

MS. ROBERTSON-DeMERS: And then indicated internal monitoring occurred at least once per year, urine sampling. And to test that thesis, I took the 25 people that I had looked at in the completeness section and looked to see if they had at least one bioassay for 1988 to the end of their employment for tritium and plutonium. And that was not the case. So I think that that statement is incorrect.

CHAIR BEACH: Is that in the response, Kathy, or was that in the initial --

MR. RICH: That's probably in the response.

CHAIR BEACH: Okay. We're just trying to find it.

DR. ULSH: Is it our white paper?

MR. RICH: Yes.

DR. ULSH: Our response, Kathy?

MS. ROBERTSON-DeMERS: Yes, page 6.

DR. ULSH: I see prior to 1987, those workers were housed in the S building. Is that the correct response, top of the page?

MS. ROBERTSON-DeMERS: Second paragraph, after 1987, all personnel who entered the control area.

CHAIR BEACH: Okay. We're having trouble finding it.

DR. ULSH: Oh, wait, wait, wait. Here it is. After 1987, all personnel who entered the control area wore personal dosimeters and were subject to routine internal monitoring at least one per year, urine sampling. That's the sentence.

I think I see where your concern is coming from. Certainly -- well, maybe. Certainly in the D&D era, there was a criteria that we expected to have a 100-millirem per year exposure. And if you were less than that, it wasn't required that you were

monitored.

MR. RICH: I think the term is subject to --

MS. ROBERTSON-DeMERS: I guess what I'm saying is that is an incorrect statement that people were internally monitored once per year. And it needs to be revised.

DR. ULSH: All right. We'll take a look.

MR. RICH: We can certainly take a look at that.

MS. ROBERTSON-DeMERS: And that was it.

DR. ULSH: Okay.

MR. RICH: That came as a response to an interview response.

MR. FITZGERALD: Okay. Well, you know, we'll be the first to admit that it was an imperfect test of a difficult question, which was, can you demonstrate that the most highly exposed individuals, in fact, badge?

So, Brant, you're not going crazy.

Actually, it was an external badging issue. It morphed. As we got into these buildings, it kind of morphed into, well, they also bioassay. But it began with the badging question.

We interviewed over 40 workers. And I think I said this the last time we touched on this issue. And one of them challenged the supposition that, in fact, they were not badged going into controlled areas.

I think there was a statement, though, in the ER that -- (***PART 6, 2:44:26***)

CHAIR BEACH: Page 71, I think it is.

MR. FITZGERALD: Okay. I won't dispute that. The concern is that because it kind of asserted that because workers were required to wear dosimeters in radiation-controlled areas, it is certain, quote/unquote, that those receiving the highest dose were monitored, we wanted to find

somebody to substantiate that.

I think this came up as a possibility. And I think we accept certainly NIOSH's very detailed findings on this. And I don't dispute that these ostensibly rad buildings had certain histories, as Bryce has gone through. That doesn't really give us any relief on the question.

So I think we are back where we were saying that since we have not, frankly, heard any statements or testimonials, as we have at other sites, I might add, that there was some discrepancy on wearing badges and everything. I don't see going any further on this issue.

CHAIR BEACH: Well, I'm just thinking out loud. I haven't even thought -- as I was listening to this, I was thinking about the D&D time period. If we close this item, is there any concern for the later years that we haven't just yet addressed?

MR. FITZGERALD: I can't say we

haven't studied D&D per se.

CHAIR BEACH: Right.

MR. FITZGERALD: But based on the experience at Rocky Flats, where they actually modified the dosimetry program and selectively badged and bioassayed certain workers as a function of what they were exposed to, I would reserve judgment on that. I am kind of talking about the operating period, which pretty clearly they had a centralized control system that was fairly rigorous.

MR. RICH: Josie, if I could just make a statement, too?

CHAIR BEACH: Sure.

MR. RICH: Our review fundamentally covered the operational history of the buildings in question. It did not cover the D&D.

CHAIR BEACH: Okay. That's all I needed to know. Thank you.

So at this point, SC&A, you are okay with this?

MR. FITZGERALD: Yes. I mean, like I said, we thought this would be a good way to test the hypothesis. It turned out not to be a good way to test it. But, you know, that's the way it goes.

And I think at this stage, without any other corroborating information that suggests otherwise, I mean, I think we can accept certainly the statement there.

And we were concerned that the statement didn't seem to have corroboration. And when we went and looked for documentation, it turned out there wasn't a badging policy that we could find in writing.

CHAIR BEACH: Right, right.

MR. FITZGERALD: And so one step led to another. And that's how we came down this road.

CHAIR BEACH: Right.

MR. FITZGERALD: It's so hard to remember all of that, but that's how we came down the road.

So I think, rather than expend more resources trying to find something on this, I think if I would make a statement, I think we would have heard more concerns expressed by the workers.

CHAIR BEACH: The workers.

MR. FITZGERALD: They would probably want to do more, but I think the workers uniformly felt they were badged in controlled areas. So I think we have confidence based on that at least.

CHAIR BEACH: And I guess since Kathy brought up initially, are you comfortable with that as well, Kathy?

MS. ROBERTSON-DeMERS: I would just like to see that statement that everyone was monitored annually internally taken out of here.

MR. CHEW: Or modified.

MS. ROBERTSON-DeMERS: Or modified, yes.

MR. CHEW: Modified, yes.

Modified.

CHAIR BEACH: So, then, NIOSH agrees with that.

From my standpoint, based on the fact that we have closed the other issue early yesterday on the non-badging issue, I think it's clear that there isn't an issue with badging based on what the workers have said in their interviews.

I have no problem closing this issue, but I do want to hear from other Work Group members on their thoughts or --

MEMBER CLAWSON: I just found it -- and this is just from the interviews that we have there because there was no question about going into the controlled areas and so forth. As a matter of fact, a lot of the maintenance people made comments that they had different badges for different areas for them to be able to go in there.

But what they stated to me was that the problem got into when they were working

outside the buildings, where they shouldn't have been when they needed to be. And then tieing into these old buildings is where they got into some of the issues where they weren't badged.

I don't know how to follow up with that, but I just want to go on record as saying that there were times where this came from with the electricians and so forth because they were basically on the other side of the walls of the production. So they felt okay. We're not violating any RWPs or anything else like that or digging enough lines.

All of a sudden, they got into stuff that they did not expect.

DR. ULSH: I think you have to ask what happened in situations like this. Let's envision a scenario, Brad, where a worker was going into an ostensibly clean area and then it's discovered later, after he worked on a particular piece of equipment, that that

equipment was contaminated. So what would you do?

MEMBER CLAWSON: Well, part of the thing came out that this side of the building was actually considered non-radiological and so forth and they had put in a whole new power bank that had been in there.

And then they've basically come to find out as they were doing the QA inspection of these power banks that were in there, they've come to find out that it was actually an almost high radiation area. And they never knew that until they got into it.

Then they went and put the --

DR. ULSH: When you say high radiation area, I assume you're talking about contamination levels?

MEMBER CLAWSON: Well, yes, contamination I guess, radiation.

CHAIR BEACH: So high contamination.

MEMBER CLAWSON: High contamination

area or whatever because I guess what it was was the pipes and so forth that went over into the operational area and so forth.

DR. ULSH: Yes.

MEMBER CLAWSON: And what they ended up doing was actually pulling a lot of that wire back in. It was all laid out there. And they got into issues on that.

My question to them was, well, what happened after that? And he said there was just a change to the RWP and the outside of the door, they put up a potential internal contamination area.

DR. ULSH: I think you would be concerned in a situation like that. If a worker went into an area where there wasn't supposed to be any contamination and it turns out that there was, if they didn't follow up and go make that worker give a bioassay or if he wasn't on a routine bioassay program, I think that might be cause for concern.

MEMBER CLAWSON: Right.

DR. ULSH: But I haven't seen evidence that that is the case. I mean, certainly there were situations where, like you described, they went into a situation where there was unexpected contamination.

But what you would hope to see I think that we did see would be in a situation like that, the worker would be required to give bioassay or he was already on a routine bioassay program.

MEMBER CLAWSON: Right. And --

MR. RICH: Brant, that is true that these were -- it's par of the discovery process. And incidents happened like that. And that would trigger, that did trigger, special sampling and whatever to make sure that the workers and properly clothed were covered by evaluation of what intake would have occurred.

MR. CHEW: Brad, I think I would need to make a comment. And you know this for the record here. When you talk about the

contamination, especially with things at Mound, you know, a badge, a TLD badge, does not pick that up.

MEMBER CLAWSON: Right.

MR. CHEW: When you talk about high radiation, it could be contamination level. But that does not necessarily mean that the badging is going to pick that up.

MEMBER CLAWSON: Right.

MR. CHEW: I just wanted to be sure you know that.

MEMBER CLAWSON: Yes. I appreciate that. You know, I just wanted to make sure that we addressed that because we had heard it a few times. But I just don't want to close the door.

MR. FITZGERALD: Well, that's the down side to badging just for the rad-controlled areas because if there was anything that arose outside of those areas, there is potential there. Again, I think --

MEMBER CLAWSON: And I think in the

later years --

MR. CHEW: You need to know what it is.

MR. FITZGERALD: Yes.

MEMBER CLAWSON: -- when they broke into those lines and stuff, I think there was a line that was broken loose out in the ground there that --

MR. FITZGERALD: This gets into the events.

MEMBER CLAWSON: Yes. That gets into the events.

MR. FITZGERALD: What is the protocol for responding to those events I think is what --

MEMBER CLAWSON: Okay. Well, I just --

MR. FITZGERALD: But I think D&D, though, is a different set of conditions because I think the monitoring system changed. And I think that would be a different story that would need to be looked at.

MEMBER CLAWSON: Okay.

CHAIR BEACH: And I only brought that up because I didn't want to lose anything in that era. But it sounds like we're okay.

With the lack of policies, I know SC&A has looked for policies on the non-rad buildings, haven't found anything. So I guess I couldn't see anything more further that we could ask SC&A to do.

And with no complaints from workers on the badging issue, I feel like we just are at a point where we should close this item unless anybody feels strongly or has an idea of anything else that we could look at.

MEMBER CLAWSON: No, I don't.

CHAIR BEACH: Yes. Okay. So we will consider --

MR. MORRIS: You --

CHAIR BEACH: Go ahead, Bob.

MR. MORRIS: Considering that it takes a rewrite of the DOE classification review to get it changed to a document or not

--

DR. ULSH: This wouldn't require DOE review. It's not a separate issue.

MR. MORRIS: You've got it in the transcript. I was wondering if we really needed to revise this last document.

DR. ULSH: It's a matter of --

CHAIR BEACH: No. I think just deleting the sentence should be a simple matter. Thank you for pointing that out, but Kathy did ask. And NIOSH did agree to delete that sentence. Okay.

So are we okay, then?

(No response.)

CHAIR BEACH: Great. So let's consider that closed. And I think it's time for a break. So let's take 15 minutes. Resume at, let's say, ten after. Is that okay?

(Whereupon, the above-entitled matter went off the record at 2:55 p.m. and resumed at 3:06 p.m.)

CHAIR BEACH: We're going to jump to the place in the D&D years. And basically the reason I put that on the agenda is I just had a question to pose to NIOSH on what we were going to do with the D&D years, where we were going with that or when we would see something on those years.

DR. ULSH: Okay. Well, just to do a very brief recap, when we presented our evaluation, our ER, at the Las Vegas meeting, -- I don't even remember when it was now -- beginning of 2008, I think --

CHAIR BEACH: Yes.

DR. ULSH: -- we reserved -- I mean, we recommended a class, '49 to '59, and then no class after that, but we reserved judgment on the D&D years. And the basis for that reservation was the Price-Anderson Act violations.

CHAIR BEACH: I'm not clear on that, what that means.

DR. ULSH: The Price-Anderson Act

violations, in and of themselves, the Price-Anderson Act violation doesn't say necessarily anything about the ability to reconstruct dose. But in this situation, they dealt with adequacy of the Mound bioassay program.

So we wanted to take some time to evaluate whether or not those Price-Anderson Act violations impacted our ability to reconstruct internal dose at Mound.

I think, Josie, that we have captured this item at other places in the matrix under, I think it is, issue 21, the Price-Anderson Act.

CHAIR BEACH: Right.

DR. ULSH: So I don't necessarily think that we have a separate matrix item to deal with the D&D years unless there are other questions beyond that. But that is --

MEMBER CLAWSON: I've got one thing because just looking at the work history on this, after this Price-Anderson Act incident

happened, isn't this when Dade Moeller and Associates came in and did --

CHAIR BEACH: MJW.

MEMBER CLAWSON: MJW. Oh, okay. MJW came in and did a -- I think it was because of that that they came in, wasn't it? I'm just trying --

DR. ULSH: I think that's accurate.

MEMBER CLAWSON: Okay. They did a --

MS. ROBERTSON-DeMERS: It was from a lawsuit.

DR. ULSH: Oh, that's right. It was because of a lawsuit, Brad, that it was filed.

MEMBER CLAWSON: Okay. That's when they came in, and they went through some of the dose --

MS. ROBERTSON-DeMERS: The internal dosing.

DR. ULSH: That's right.

MR. FITZGERALD: I guess the

context of that issue for us was more the change in regime that's experienced under D&D, whether that poses any implication for dose reconstruction.

We didn't see it as a Price-Anderson Act, per se. And, actually, I think we ere more focused on the other issue that dealt with the Price-Anderson implications, as treating that issue.

So, to some extent, I think we have a different frame of reference for what that issue, D&D, would be. This was also from the experience with Rocky Flats.

You know, it just was two different regimes. And we went through some effort to figure out whether that change had to be changed for dose reconstruction.

You recall we went through this question of lack of terminal bioassays, transient workers, how they would badge, and all of this. And I think we wanted to address that, but it was being held open -- not open

but deferred. So we couldn't really engage that issue.

Now, going back to the matrix, I think that is the way it was described in our issue matrix. But that would be the question I would think I would raise on that.

DR. ULSH: Matrix somewhere?

MR. FITZGERALD: Yes. And, of course, I --

MS. ROBERTSON-DeMERS: I have a copy of it, but I --

MR. FITZGERALD: I have a copy, but I think --

MEMBER CLAWSON: Their whole rad practices changed after the production era, didn't it?

MS. ROBERTSON-DeMERS: Yes. Their whole rad practices changed as a result of that lawsuit.

MEMBER CLAWSON: Well, I thought after the lawsuit a lot of things went on, but then through the D&D era, they had a lot of

changes to who was being bioassayed and everything else like that if I remember directly some of the issues.

MS. ROBERTSON-DeMERS: Well, I'm not just talking from the standpoint of bioassay. I'm talking from field monitoring --

MEMBER CLAWSON: Right.

MS. ROBERTSON-DeMERS: -- and upgrades to field monitoring.

CHAIR BEACH: It's on number 10. It's issue 10. Sorry. I just realized that.

MR. FITZGERALD: Yes. This is our statement I am reading from, actually your response from last July: Evidence exists that worker exposure residual contamination to sources generated during the life of the plant, particularly during D&D activities, in which bioassay is not performed. Lapel sampling and DAC-hour tracking were used as a primary means of tracking internal dose, rather than routine bioassay.

In fact, Mound went to Rocky Flats to model their system after Rocky. I recall that coming up.

Samplers who were assigned randomly to a group of D&D workers might not have represented the most exposed individual. You know, pretty much the same issues I think we addressed at Rocky would be the same issues we would want to be clear on here.

SC&A agrees that issues like these associated with internal exposure during D&D activities warrant special consideration in the context of the SEC.

Actually, there was NIOSH response. And it says, the SC&A statement above does not accurately represent NIOSH's concerns with the bioassay program in the D&D era.

And then you went on to talk about Price-Anderson.

DR. ULSH: You see that problem persists.

MR. FITZGERALD: It says, NIOSH has

never expressed concerns about lapel sampling and worker exposure, residual contamination, and all the other points we raised. And that is kind of where it ends.

DR. ULSH: So our NIOSH response as of July 5th, 2008 is kind of the last action on this issue?

CHAIR BEACH: It is exactly the last action.

DR. ULSH: Okay.

CHAIR BEACH: That's why I raised it today.

DR. ULSH: I see.

CHAIR BEACH: We need to know what is happening and where we are going with that.

DR. ULSH: There is more you would like to see, in addition to our response?

CHAIR BEACH: Well, Joe, you said SC&A is kind of not touching it because --

MR. FITZGERALD: Well it was being reserved for further research. And that was --

MS. ROBERTSON-DeMERS: We're in the process of investigation.

MR. FITZGERALD: We are doing more investigation. Now, the context is Price-Anderson, but the issues that we are concerned about are pretty much the same issues we are concerned about in Rocky as far as the change in regime and going to lapel sampling and whether or not that provided sufficient basis for estimating doses on those deeds.

And that is kind of where we left it in pursuing it from that point. And I think that it has been held open as a pending item. So I don't know. That's one reason I guess we are --

DR. ULSH: So is there an action item that you would like to see?

CHAIR BEACH: Well, either SC&A tackles it or you guys unless you're saying that is your response and that is what you are sticking by or if you want to review it and

get back to us. I mean, I know it is --

MEMBER CLAWSON: I thought we had kind of separated those out and didn't want to deal with the D&D era right now, we wanted to get the earlier years as kind of a focus field. We kind of separated it into two issues. I think I got the feeling -- it's my personal opinion, but that's why we kind of just held that one back and separated it in two eras.

MR. FITZGERALD: Well, I think the first time we broached it, the feedback from NIOSH was they wanted to do further investigation.

Now, I think it became clear by last year the context was Price-Anderson, but it was one of these we don't want to have this liberation in the meantime because we are doing further investigation.

Because we had enough issues to keep us occupied, we put it aside. But the question at this stage is, you resolved the

Price-Anderson questions through various means, but we still have what was originally identified as some of these monitoring issues in the D&D period that we need to address.

Now, we could. You know, basically we could pull something together since at this stage we know based on the July response that you don't agree there were any implications for dose reconstruction from the D&D period. That kind of puts the monkey on our back to show why there might be.

One thing we could do is just put this on a fast track and say, there is no Price-Anderson implication from D&D, but there may be some other implications. We need to get back to the Work Group and offer any illumination on that particular issue.

But the issues are very similar to Rocky. And I think we ended up, although there were some concerns at the end whether we might be able to resolve those issues, we did end up resolving them.

There was a stark difference in the regime.

CHAIR BEACH: But I think we owe it to the claimants to answer that question in that time period. So I am hoping -- I mean, I am fine with SC&A jumping up and writing something up or if you want to --

DR. ULSH: No. That's fine.

CHAIR BEACH: Because my note said, Placeholder Under Investigation.

MR. FITZGERALD: Yes.

DR. ULSH: We might have had this conflated with the Price-Anderson Act. I would like to take you up on your offer, Joe.

MR. FITZGERALD: Yes. We'll take responsibility to -- I think we have the documentation. We just need to clean this up, be very specific about what -- if we -- we haven't really finished any kind of analysis.

If we feel there are issues that might bear on dose reconstruction of an SEC significance, then we need to bring that back

to you and to NIOSH and go from there.

CHAIR BEACH: That's sounds great.

MR. KATZ: Just a clarification. Did the petitioner raise the D&D period as an issue?

CHAIR BEACH: I don't know if it came from that. It included the D&D.

MR. KATZ: The period did?

CHAIR BEACH: Yes. It goes to 2007, yes.

MEMBER CLAWSON: Because the petitioners raised concern of the change of rad practices and everything else like that, moving equipment and so forth. All of a sudden, buildings that were --

CHAIR BEACH: So I'm assuming that you're going to develop a white paper on that. And I'm not asking for a time because I don't want --

MR. FITZGERALD: What's good for the goose is good for the gander.

We've heard the last two days that

NIOSH is going to. You know, we will certainly do that. And we are not starting from scratch.

CHAIR BEACH: Yes.

MR. FITZGERALD: I mean, I think we did gain a lot of experience with the same issue at Rocky. So I think we can know what we are looking for and will be able to come back with something.

I know you are going to ask me next about DOE's review and six or seven --

CHAIR BEACH: And I was going to say, Joe, that I wasn't going to put you on the --

MR. FITZGERALD: I feel obliged to offer to get it out. But we will certainly move as fast as we can to do that.

CHAIR BEACH: Yes.

MR. FITZGERALD: And probably we will try to get back by the end of July depending on DOE.

CHAIR BEACH: And I think,

actually, at the end of the meeting today, most of the action items are on NIOSH again. So we are kind of back to the incline on your side of the table.

Okay. That's great.

MEMBER CLAWSON: Joe, do you think this would be where you could kind of give us an update on this one maybe because we are out here where Mound is at? I was just wondering if --

MR. FITZGERALD: I'm going to try to do what we can. I mean, I think because there are more recent records, this is a much different issue than trying to dig back into the '40s and '50s. We're talking '90s.

So the question is being able to understand the system. And we did read some -- make sure we understand the system fully and look at the implications, similar to what we saw with Rocky because they did actually model the Mound program. They did track Rocky to see what they were doing in D&D and brought

that back. So there should be a lot of similarities.

MS. ROBERTSON-DeMERS: Actually, the Rocky Flats regime moved to rad.

MR. FITZGERALD: Okay.

MEMBER CLAWSON: I was just wondering where we were up there modeling the Mound area so that some of the issues --

MR. FITZGERALD: The biggest issue came down to because they went from badging every single worker who was the most exposed individual in the DOE Act to, in fact, be monitored or not to try to answer that question.

And we got into an issue of terminal bioassays at Rocky. A lot of transient workers left the site, never got any final bioassays. And how would you address that? We did address it through the process of Rocky.

So, you know, I think we have a pretty good running start on those issues.

MEMBER ZIEMER: Josie, I have a question on this.

CHAIR BEACH: Okay. Hi, Paul.

MEMBER ZIEMER: This is kind of my standard question. It's not completely clear to me what SC&A will do versus what NIOSH is doing, but I want to make sure that SC&A is not undergoing an investigation that should rightly be done by NIOSH.

Can you clarify, Joe, a little more? I didn't get the full implication of what it is SC&A is going to do next.

MR. FITZGERALD: We're going to just focus on the D&D period, where they went to lapel sampling. This will sound a little bit familiar for Paul because this is the issue we looked at at Rocky Flats, which is when they went from an every person gets badged and going into a rad area to selecting those who they believe to be the most exposed individual and monitoring that person with lapel samples and if the lapel sample shows

something positive, then do the bioassay. So it's a different system.

The question at Rocky and the question here would be, is there documentation? Certainly we have interviews already, whether or not that was, in fact, the way it was implemented and you can rely on the data as being those who were, in fact, exposed during the D&D period.

MEMBER ZIEMER: Well, my question is, let me emphasize what I am saying. You have raised the question. My question is, who answers it?

CHAIR BEACH: And that's a good question, Paul.

DR. ULSH: Well, I think the problem, though, is that it is not clear exactly what the questions are, the issues that are of concern. I understand --

MEMBER ZIEMER: Okay. So you're asking SC&A to clarify the nature of the question?

DR. ULSH: Yes, yes.

MEMBER ZIEMER: Okay. That's fine. I just want to make sure that SC&A is not raising a question and then determining the response.

MR. FITZGERALD: Well, just to be clear on the tasking, though, we can certainly tee up the specific findings and be able to back those findings up and then see what the Work Group wants to do next.

MEMBER ZIEMER: Yes.

MR. FITZGERALD: Okay.

MEMBER ZIEMER: Well, I think, Josie, you understand what I am asking here.

CHAIR BEACH: I understand completely.

MEMBER ZIEMER: Because it's kind of my standard question.

CHAIR BEACH: Yes.

MEMBER ZIEMER: Make sure that the right group is doing --

CHAIR BEACH: Doing the work.

MEMBER ZIEMER: -- the work.

CHAIR BEACH: Yes.

MR. KATZ: Can I just seek clarification, then? In the NIOSH report, did you reserve this section with respect to the evaluation report or --

DR. ULSH: Yes, but that was based on Price-Anderson.

MR. KATZ: Okay.

DR. ULSH: These are separate.

MR. KATZ: So it is still reserved in the NIOSH report as the documentation --

DR. ULSH: We revised the evaluation report if that is what you mean.

MR. KATZ: Okay.

DR. ULSH: And we have given our position on the Price-Anderson Act issues on the record here at a Work Group meeting, but we have not revised the evaluation.

MR. KATZ: I see. But in giving your response with respect to that, do you think that closes out the reservation? That

completes the evaluation report, in effect, with respect to that period?

DR. ULSH: That closes out our reservations based on the Price-Anderson Act. But Joe is saying that there might be others --

MR. KATZ: I understand. I am just saying that if we hadn't closed out our work, then it would be really OCAS' step, not SC&A's, to lay out questions or criticisms. It would be OCAS' to lay out, here is how we plan to do things and then SC&A to consider that.

DR. ULSH: Well, I think we have done that for the Price-Anderson Act stuff. We are going back and forth. I mean, still I think the latest iterate was SC&A's response to our white paper that agrees on some issues and a couple of issues doesn't hit. So that is still --

MR. KATZ: Well, I'm just sort of resonating with what Paul is saying.

DR. ULSH: Yes.

MR. KATZ: If it is not clear what OCAS plans to do going forward. Then it shouldn't be for SC&A to lay out, here is where we think the vulnerabilities or problems are if what OCAS has already laid out, here is what we are going to do.

DR. ULSH: No. Our position is during the D&D years, we can do dose reconstructions with sufficient accuracy.

MR. KATZ: Okay.

DR. ULSH: But SC&A has raised some questions related to D&D. We just want to clarify what those issues are.

MEMBER ZIEMER: Okay. I just wanted to make sure that that was the case.

CHAIR BEACH: So I guess we will retract what I said about a white paper. And, really, what SC&A is going to do is pose the questions back to NIOSH.

MR. KATZ: If it has concerns.

CHAIR BEACH: If it has concerns.

Okay. That helps. Thanks, Paul.

MEMBER ZIEMER: Yes.

MR. KATZ: Thank you.

CHAIR BEACH: Okay. Anything else on that portion?

(No response.)

CHAIR BEACH: I guess the last item on the agenda, then, is to look at the road map, integrated issues and --

MEMBER CLAWSON: You know what, Mel? I really would like to -- I apologize. I didn't think you --

MR. CHEW: Yes. I was going to walk down exactly where we are with news and the road map. I think there were two action items that came out of the last July meeting. They were put into incident reports and then looked at the RWPs relating to the D&D area.

The first part has been incorporated into this new road map. I was going to walk you through to see what is new. I just want to make sure from a security

standpoint that this version that you have, the pfp version, has been redacted by the DOD.

I made probably a fatal error that I will never make again. I sent Kathy a Word file, which I will probably regret later on. Anyway, let's delay it to next time. It will be worthwhile for you to look at the --

CHAIR BEACH: So the only thing that I want to ask on the road map is I know there is an additional version to it. I would like to see if that version can be shifted to Hanford for viewing by Kathy and myself, Dennis.

DR. ULSH: Yes. We'll coordinate with Gina Cano and Greg Lewis and see if we can make that happen.

MR. CHEW: The other version I want to make sure -- this will only take a few more seconds -- I was going to point out clearly locations were referred to Appendix B. Okay?

And we're very cautious not to assume that if anything was in Appendix B that

I saw what was in Appendix B and also did not see any of the other reference documents that were used in unclassified sources here they are not in here. I just want to make sure you know that.

The caution that we all need to exercise is that this is a road map that came from many different sources. And so you understand the implications of that.

You understand the reports that are there. There are 75 of them. We gave you the SRDB numbers to reference that. That was one of the deliverables. And so we can talk about the PWPs or the work permits for the D&D area.

There is a lot more detail in this particular document than what you have seen in the past. Please start at the very top and look at the color coding. You will enjoy that.

I want to first Sam Chu and Gene and Leo, who spent diligent hours in putting this kind of a road map together.

CHAIR BEACH: Great.

MR. CHEW: I think it was very worthwhile because Mound is a very complex site with a lot of different things. And what I was showing them was how it shows up chronologically. You don't get that feeling when you look at this particular road map of chronology, when those things were handled. And that's why I was going to talk to walk through it.

Maybe we can do something to get that in your hands so you know that it has been handled, redrumming of zoning for this particular period and time in that particular building. You get that feeling.

DR. ULSH: I think when we reconvene at another location, we will maybe take you up on your offer to walk us through.

CHAIR BEACH: Yes.

MR. FITZGERALD: We can dovetail. It is something we're going to have to do later.

CHAIR BEACH: Right.

MR. CHEW: I'm done.

CHAIR BEACH: Thank you.

And apologies if that seemed really quick, but we are losing two Work Group members now.

MR. FITZGERALD: I think that's a good point. Let me read. We have been trying to figure out what the evaluation report said. Actually, it matches pretty much both of what we are saying. So I guess we both feel about it.

It's three sentences, D&D era bioassay. There had been concerns expressed by numerous former workers about whether the bioassay requirements matched the exposure potential to workers during the D&D era. This is exactly what we are focusing on.

Then the next sentence, Envision there were several Price-Anderson Act violations and crimes during that period. NIOSH continues to investigate whether these

occurrences compromise its ability to perform dose reconstruction with sufficient accuracy. That is the only entry that is there.

DR. ULSH: I think I see where the confusion comes. The third sentence related to the second and not --

MR. FITZGERALD: Right, right.

DR. ULSH: -- from us.

MR. FITZGERALD: Right. And I think that first sentence captures what we are looking at, which is whether the exposure potential of workers matched the requirements and whether those requirements were implemented effectively during that era. That is kind of what we have to tee up.

This appears that the ER actually acknowledges the concerns. We heard the same concerns in our interviews from the D&D era workers. So I think that is an open issue that we ought to -- actually, ER acknowledges that it is an open issue.

CHAIR BEACH: And, in closing, for

the last item, Future Meetings, we have nothing planned at this time. The action items that came from the two-day Work Group, I will send out an e-mail to the Work Group and NIOSH, SC&A. And then we can make additions or changes if there is something I may have missed.

MR. KATZ: It's about a two-month time frame for a lot of these deliverables --

CHAIR BEACH: Right.

MR. KATZ: -- that have been teed up today. So it is looking like the next Working Group meeting probably won't happen until early August.

CHAIR BEACH: Right. I agree with that. Okay. Thank you.

MR. KATZ: Thanks, everyone on the phone.

(Whereupon, the above-entitled matter was concluded at 3:30 p.m.)

1

2

3

4