U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
CENTERS FOR DISEASE CONTROL
NATIONAL INSTITUTE FOR OCCUPATIONAL
SAFETY AND HEALTH

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ADVISORY BOARD ON RADIATION AND
WORKER HEALTH

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WORK GROUP ON TBD 6000

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THURSDAY
JUNE 14, 2012

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The Work Group convened telephonically at 9:00 a.m., Paul L. Ziemer, Chairman, presiding.

PRESENT:

PAUL L. ZIEMER, Chairman
JOSIE BEACH, Member
WANDA I. MUNN, Member
JOHN W. POSTON, SR., Member

ALSO PRESENT:

TED KATZ, Designated Federal Official
DAVE ALLEN, DCAS
BOB ANIGSTEIN, SC&A
JENNY LIN, HHS
JOHN MAURO, SC&A
DAN MCKEEL
JIM NETON, DCAS
JOHN RAMSPOTT
MUTTY SHARFI, ORAU Team
JOHN STIVER, SC&A

C-O-N-T-E-N-T-S

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

(9:02 a.m.)

MR. KATZ: Welcome, everyone, good morning. Advisory Board on Radiation Worker Health. It's TBD-6000 Work Group. We are going to be discussing GSI residual period during this Work Group meeting. And let's begin with roll call.

(Roll call.)

CHAIRMAN ZIEMER: Okay. Thank you very much. The focus of our meeting today is on the residual period for General Steel Industries. The agenda was distributed and is also posted online. Also, the other documents referred to, I'll just very quickly mention them sort of in the order that we received them.

We have a May 30th document from SC&A called, Update of Review of Site Profile for Atomic Weapons Employees that Worked Uranium and Thorium Metals, Appendix BB,

General Steel Industries, Battelle TBD-6000, Appendix BB, Occupational Internal Dose. That's the title on the paper.

We have a June 8th document from NIOSH entitled, Battelle TBD-6000, Appendix BB, General Steel Industries Response to SC&A Memo, dated May 30th, 2012. We have a document dated June 1st from the co-petitioner called, Petitioner Comments on SC&A Discussion Paper, dated 5/30/12, and gives the title of the SC&A paper, and that's by Dan McKeel.

And then we have a June 11th report, again, from SC&A called, Reply to NIOSH Response to SC&A Memo dated May 30th, 2012. Also, just for reference, the updated resolution matrix for Petition 00105, the June 1st version of that, which also has been distributed.

So what the intent was was to have SC&A begin with their review on the residual period. Now, keep in mind that there was an

original review and it wasn't clear to me that it was very specific. There weren't any findings on that residual period in that review and it wasn't clear, exactly, what SC&A's position was relative to the NIOSH recommendation.

So Bob Anigstein was asked to clarify the SC&A position, and that initiated this series of papers. There's been some changes, as I understand it, in SC&A's position since the first paper, but let's let Bob go ahead and kick this off. And, Bob, you can updated as you go if you wish, because things have changed a little bit on the SC&A view as you went along.

MR. KATZ: Paul? This is Ted, I thought you had wanted Dave to provide the initial presentation, cover the initial --

CHAIRMAN ZIEMER: That's right. I'm sitting here looking at an earlier draft of the agenda and I apologize for that. Dave

can go ahead and kick this off. Right.

MR. ALLEN: Okay. Thanks, Paul. This is Dave Allen, NIOSH. I was just going to briefly go over the White Paper I wrote on June 8th, and some of that was in response to SC&A's --

CHAIRMAN ZIEMER: Right.

MR. ALLEN: -- review, so I think Bob will then go over the update of that.

CHAIRMAN ZIEMER: Right.

MR. ALLEN: He can cut in if I say something wrong.

DR. ANIGSTEIN: No. I'll let you finish.

MR. ALLEN: The White Paper I wrote, part of that went over the methodology and the appendix, right now, for the residual period, so I just wanted to go over that, just briefly, to describe how that estimates dose.

It starts by using TBD-6000 slug production. The reason that was chosen is

that is handling quite a bit of uranium metal, that process, that is essentially what GSI did was handle uranium metal as far as airborne contamination.

And in slug production, it's actually the oxides of uranium metal that are inhaled. Nobody inhales a slug, or a 300-pound derby, or anything. Oxides are somewhat proportional to the surface area of the metal and slugs are smaller, have a lot more surface area, so that portion of it should be higher or bounding on GSI, since they handled larger pieces of uranium metal than slugs.

Also, the slug production dealt with cutting and grinding on the metal, which was, by far, the highest airborne-causing operation in slug production. And GSI X-rayed uranium metal without actually manipulating the metal as far as cutting, grinding, or any kind of abrasion.

So this was described in the

appendix that the slug production should be bounding on GSI. In TBD-6000, that is assumed to be a full-time operation, the slug production, and GSI uranium work was not full-time, so it was prorated to the time frames in the appendix of uranium work.

It was also assumed that the motive force to actually get this oxidation off of the uranium and into the air was only present while people were handling the uranium and it wasn't present while it was sitting there being X-rayed.

So in the appendix, we took the slug production airborne concentration was present in the air the whole time the uranium might have been handled and let that settle on to the floor to calculate a surface contamination level.

Then we resuspended that with a 1 times 10 to the minus 6th resuspension factor to calculate airborne activity. That was what

we used for the residual period.

Also, calculated an external dose from that surface contamination, but that turns out to be fairly low, and then we realized it is possible to get contamination and concentrate it in one air and increase that external dose rate in a localized area.

And we found that that is what happened at GSI and they had a vacuum cleaner that had an external dose rate study. They had a small external dose rate coming from a vacuum cleaner from uranium inside it.

Still fairly small because, uranium, you don't get a great deal of external dose, and therefore, we just used that dose rate since it was higher than the calculated dose rate from surface contamination, and we used that for the full-time in the residual period.

With that explanation, I think that answered a couple of misunderstandings on

the original SC&A review on how we had did our dose estimate, and I think Bob will probably speak to that.

I also mentioned, in my White Paper, in response to SC&A's first White Paper, that the times that we worked with uranium, that's somewhat in debate there. What we did was took those purchase orders based on the hourly rate and the monthly value on it.

We calculated a maximum monthly hours that they could have been working with uranium under those purchase orders. And, in general, in the beginning, it was $450 per month.

That very first purchase order for four months was actually $500, and I believe the other year was actually just an annual limit that didn't add up to that, and it was a little higher, so we increased that year.

In the later years, the limits

started going down quite a bit, but $450 is the general rule, and the thinking was that they started off with $500 a month for four months, and then dropped it to $450, and kept it at that level.

So we were thinking that the $500 was an estimate and the $450 was what they reduced it to as a limit, so we were thinking that that is, essentially, what they learned from that first four months that they needed. And, yes, I don't think there is agreement on that, but that is what we did in the appendix.

And I spelled out, basically, that reason and pointed out that the rest of the purchase orders were on a fiscal year basis, but this first one started off in March, so it was only for a four-month period, and it appeared to be the start-up of, or probably restart of, some work.

And I pointed to a memo, a couple memos, that indicated some work that was done

in February, and it wasn't much. Doesn't really say uranium, but the timing all seemed to work out to where that looked like it probably was that positive. It was just one more piece of information.

And I believe Bob also pointed out in his review that we didn't base the external doses in the appendix on 3250 work hours per year, and we agree.

I mean, all the calculations we had done for the operational period for, you know, the Work Group, with those last several White Papers, et cetera, are all based on 3250 hours per year, and that is what we intend to do with the residual period also when we get everything resolved and revise the appendix.

I think that's all the overview I intended to give there. I'm open to any questions or we can go to Bob.

CHAIRMAN ZIEMER: Okay. Let's see if there's any general questions for Dave

Allen first, and then we'll go on to Bob.

MEMBER POSTON: Paul, this is John Poston.

CHAIRMAN ZIEMER: Yes.

MEMBER POSTON: I just had a quick question on one of the things in Dave's report I was working through. It's on Page 1. It's the bottom paragraph. And I believe there's a unit missing there, because if you do a unit analysis, it doesn't come up d per m per day. And that's just a correction --

CHAIRMAN ZIEMER: You're talking about the paragraph that begins with 198 d per m per cubic meter, right?

MEMBER POSTON: Right. And as you go across, after fraction of time in vicinity of the uranium, it should say one year per 365 days to make the units work out. It's probably just a typo. I mean, I think the numerical values are correct, but the units don't work out unless you put a year in there

somewhere.

MR. ALLEN: Oh, I see what you're saying. Yes, I think you're right. It should have said, the real conversion would have been 365 days per year.

MEMBER POSTON: Right.

MR. ALLEN: I didn't put per year in there.

MEMBER POSTON: Yes.

CHAIRMAN ZIEMER: Oh, yes. The 365 is there, but the year part isn't.

MEMBER POSTON: Right. Yes.

CHAIRMAN ZIEMER: Yes.

MEMBER POSTON: So that's just a correction that needs to be made to make it accurate.

CHAIRMAN ZIEMER: Right.

MEMBER POSTON: And it says here, but I just want to hear a yes anyway, basically, you were talking about the intakes between operations. It says you assume the

maximum air concentration existed the entire time the workers went in the area.

You took an average of that, is that what you're telling me? That's on Page 2, first paragraph, last line.

MR. ALLEN: All I was trying to say there is, essentially, in the appendix, we estimated 15 minutes to set up the shot and 15 minutes to take it down.

MEMBER POSTON: Yes.

MR. ALLEN: So I think it was 30, 30, and then an hour to take the shot. And we assumed that whole time that they were in there that it was a 198 dpm per cubic meter, you know, from the second that started.

MEMBER POSTON: Yes. Okay. I just wanted to clarify that. That's what I got from this, but that's a pretty generous assumption, don't you think?

MR. ALLEN: Well, actually, I don't think that one's too generous because

when you're dealing with the settling, I mean, we also assumed that it disappeared instantly when they walked out of the room, which is also not true.

MEMBER POSTON: Oh, yes. Okay.

MR. ALLEN: When you're talking about the settling, it's a build-up, and it's a drop-off, and you --

MEMBER POSTON: Yes. It depends on the particle size and all that other stuff, yes.

MR. ALLEN: Yes.

MEMBER POSTON: Okay. I just wanted to make sure I understood exactly what you were saying.

CHAIRMAN ZIEMER: You're dealing with it as if it's a step function.

MEMBER POSTON: Yes.

CHAIRMAN ZIEMER: It starts off at the top and it stays there continuously till they leave.

MEMBER POSTON: Yes. It's like a switch. When you walk in the door, it goes to maximum.

CHAIRMAN ZIEMER: Right.

MEMBER POSTON: When you walk out, the door, it goes to zero.

CHAIRMAN ZIEMER: Right.

MEMBER POSTON: Okay. All right. I understand.

DR. MCKEEL: Dr. Ziemer, this is Dan McKeel, may I make a comment?

CHAIRMAN ZIEMER: Sure.

DR. MCKEEL: Dave mentioned, when he was reviewing what was done at the slug production facility, he made a comment that there was no cutting, grinding, or abrasion of uranium at GSI.

And one of the points that I want to reinforce is that, although that was not done as a machining operation, those large slugs, I mean, the large ingots and dingots

that were brought over from Mallinckrodt, and even the betatron slices, were so heavy that they had to be picked up and handled by chain men and by chains.

And, of course, those chains were hanging down from a crane, the ingots and dingots were swinging, and, undoubtedly, those chains scraped the outer surface of the ingots and dingots which had not been cleaned of their outer crust.

So a point that I think has been ignored throughout this consideration of GSI, but it is mentioned by SC&A in their White Paper, that there was a long path through General Steel by which the uranium from Mallinckrodt traversed, even before it got to the betatron buildings.

So, you know, it had to come to the loading docks, we know that it was stored before and after it got there, it had to be loaded onto their railroad transfer cars,

taken along the railroad tracks, which traversed many of the buildings beside the foundry, through Buildings 6, 7, 8, 9, 10.

The railroad tracks from Building 10 went into the new betatron building, so the ORNL assumption in 1989 that the only areas that had uranium contamination were the old and new betatron buildings must have been a cost containment sort of consideration, because anybody who thinks about the process for uranium handling at GSI has to recognize that there were long pathways that probably were contaminated by chafing and scraping by the chains on those large ingots, dingots, and betatron slices.

So I think that is a major lack of the analysis of the residual period. There is zero data on uranium surveys at GSI. Real uranium survey, radiologic data, from 1952, when the first machine, betatron government-owned machine, was there until the ORNL survey

of the old and new betatron buildings in 1989.

So the idea that, somehow, the dust content in a small industrial vacuum 23 years after the plant closed is, in any way, indicative of the residual contamination in that plant is really, scientifically speaking, ridiculous, absurd, and really unacceptable.

The proper way to look at things is, there is really no representative residual period real data; air monitoring, surface concentrations. You know, we do know from worker testimony that that building, the old betatron building for instance, had been power-washed in the intervening years back in the '70s, and that small vacuum was used repeatedly, we are told, you know, every day it was emptied and so forth.

So all that represents is the residual uranium dust in that vacuum when it was probably last used. Nobody even knows when it was last used. And the other point

is, there were other vacuums, and the one that was really used to clean the floor in the old betatron building was much larger, and that one, there's no measurement of that.

So I think those points need to be put on the record. Thank you.

CHAIRMAN ZIEMER: Okay. Thanks, Dan. One connection, Dave, could you clarify the application of the activity that you're proposing. Who would this apply to, the air concentrations that you're proposing?

MR. ALLEN: Air concentrations and the external would apply to everybody at GSI.

CHAIRMAN ZIEMER: Everybody. So in a certain sense, it is considered to be present all along the pathway that Dr. McKeel mentioned, right?

MR. ALLEN: The assumption was that you got different carts that it might have come in on and different paths.

CHAIRMAN ZIEMER: Right.

MR. ALLEN: But it all ended up in the betatron building, so that should be the higher area.

DR. MCKEEL: This is Dan McKeel again, I think that assumption, again, scientifically speaking, is unwarranted. You don't know that the highest concentration is in the betatron building.

I would think that the highest concentration might be the first chain men that put the ingot and the dingot up in those chains and it started swinging around, and it had to be placed in the chains might be the highest dose.

But the point is, we can argue about it all day long, but the idea that the highest value was in the betatron building is pure speculation. Thank you.

CHAIRMAN ZIEMER: Okay. Other questions for Dave?

MR. RAMSPOTT: Dr. Ziemer?

CHAIRMAN ZIEMER: Yes.

MR. RAMSPOTT: This is John Ramspott.

CHAIRMAN ZIEMER: Oh, hi, John. We missed you earlier in roll call.

MR. RAMSPOTT: Absolutely. I'm actually in route to an animal hospital --

CHAIRMAN ZIEMER: Okay.

MR. RAMSPOTT: -- for an emergency. So everything is stable now. I can chat a minute. Dave, if I could ask a question, the quantity that you're talking about. Where did you get the quantity that you're talking about, the dust? Can I ask, where did that come from, that information?

MR. ALLEN: Are you talking about the quantity on the floor for the residual period?

MR. RAMSPOTT: Yes.

MR. ALLEN: Well, like I explained, we took the slug production

airborne concentration that we've seen at slug production facilities and assumed that concentration was there the whole time people could have been kicking the --

MR. RAMSPOTT: So are you saying you're using another site rather than GSI, and the vacuums, and all that? Is that what you're saying?

MR. ALLEN: For the airborne --

MR. RAMSPOTT: Yes.

MR. ALLEN: -- which then settled to the floor, yes.

MR. RAMSPOTT: I was curious because I heard Dr. McKeel say that if it was coming from the vacuum, you know, cleaner or what have you, that's definitely false because that thing had been emptied bazillions of times, and that other vacuum that Dr. McKeel is talking about is actually the size of a golf cart. We have pictures of it. They drove it.

So that's how big that was. So anything that was there in a cleanup was minuscule compared to what was really there during the operation period. Okay. I'm just curious, just wanting to clarify that, and get it on the record.

So it's really not from GSI. It's from another site.

MR. ALLEN: Well, we did end up --

MR. RAMSPOTT: Okay.

MR. ALLEN: -- using the vacuum cleaner for the external dose because it was --

MR. RAMSPOTT: You are using the vacuum cleaner for external, though?

MR. ALLEN: Right, because it was higher than what the external dose we calculated --

MR. RAMSPOTT: Oh, well, then that's my point. That external dose from a vacuum cleaner that they inspected in 1989 had

been emptied between 1966, I guess when the uranium quit, and till '89 -- I mean till '74, at least, anyway, when GSI closed.

And then there were other people moved into that building, that's why everything was power-washed, actually with a fire hose, it was a little power-wash, and we actually have a worker that everybody's familiar with, his son was on that crew that actually cleaned that up with a fire hose.

They had to clean it up so they could remodel it to use it for storage. So same thing with the new betatron. I guess my point was: there's very, very little of anything left in that vacuum cleaner in '89 for the cleanup that could have been in there during the real '53 to '66 period.

CHAIRMAN ZIEMER: So if you didn't have the vacuum cleaner you would have used what?

MR. ALLEN: I'm sorry. What?

CHAIRMAN ZIEMER: In the absence of the vacuum cleaner, what value would have been used?

MR. ALLEN: We would have used external dose from the surface contamination we had calculated, which is the point I was going to say was that, I somewhat agree with John. There's no guarantee the uranium or whatever radioactivity inside that vacuum cleaner, was from the Mallinckrodt uranium.

It could have been from other sources from natural-type of active materials that that type of site would see. But that surface contamination could get concentrated and increase the dose in a small localized area.

MR. RAMSPOTT: Well, I guess the point I'm getting it is: the number you're using is from an inspection in '89 and, you know, you got to empty a vacuum cleaner, so it's been emptied. So whether it's some of

GSI's residual dust or it's uranium dust, the original is gone.

DR. ANIGSTEIN: This is Bob Anigstein. I'd just like to comment on this, but perhaps I could help clarify Dave's, if Dave doesn't mind my stepping in, because it's his area. It's just one comment on the spot.

What they did, I mean, it's in the report, but perhaps it needs to be highlighted. What ORNL did was they put a survey meter right flat against the vacuum cleaner. In other words, in contact with it. They took the exposure rate. What NIOSH did was: they assumed that a worker was in contact with this vacuum cleaner. Now, first of all, that's way overstatement because the survey meter has an active volume of a few cubic inches.

The volume of a human body is much larger than that, and yet we're assuming that the entire body got that dose rate. So even

if they were standing with that vacuum cleaner pressed against the abdomen, well, possibly an organ right there would have gotten that dose rate.

They were assuming that every worker in that place was, basically, hugging that vacuum cleaner for eight hours a day or their whole shift, and that is a very conservative bounding estimate.

However, the point of this is to bound the doses and it's highly unlikely that, even if there were any other gamma sources in the plant that had been overlooked, we're not talking about going back to '52 or '53, we're going back from '66 on, when there was no more uranium being brought in, and this is what NIOSH found.

This was the only thing that was found, and all I can say is, it seemed like a very conservative estimate to bound the doses. And I'm sure if there had been other sources

around, NIOSH and SC&A would have looked at them.

But, you know, we do the best we can. I don't think there's any site that ever has perfect data, that ever has the kind of -- in other words, if we had a time machine and could go back, say, we knew we were going to do this study and we were given adequate budget, we would have traveled back to July 1st, 1966 and went around with a team of surveyors with survey meters and looking at the entire plant, along the railroad tracks, any place where plausible that uranium could have been, and we would have tried to find it.

But we do the best we can with what we have.

CHAIRMAN ZIEMER: Okay. Thank you.

DR. MCKEEL: Dr. Ziemer? I really would like to respond to the last couple of comments.

CHAIRMAN ZIEMER: Sure.

DR. MCKEEL: My comment is that, no, the point is not to bound the dose, the point of the SEC and the residual period is to bound the dose with sufficient accuracy. That's the test, sufficient accuracy. And I would agree that the assumptions made with respect to that tiny vacuum cleaner in 1989 are very conservative or claimant-favorable.

But my point is, it's really the larger point, that small vacuum cleaner is not representative of any plant-wide value of residual uranium at all. It's one point. One little, teeny-tiny area in the old betatron building that is separated by 100 yards from the rest of the plant complex.

And when Bob Anigstein says we try to do our best and no site has perfect data, I really have a problem with that kind of thinking. In an operation such as this, which is supposed to be based on good science, not

only is the data not perfect at GSI, there almost is no real measured data.

And I would suggest that at many, many, many sites that are on the record, the residual period is full of air breathing data, film badge monitoring data, all sorts of data, hard, measured data, that could be used to bound the dose with sufficient accuracy.

But to somehow say that the best we can do is sufficient, really means to me that, given any data at all, datum at all, one piece of data, a single piece of data, that NIOSH, I guess with SC&A's dissent, is willing to bound the entire residual period from 1966 to 1992.

And the proper conclusion, the proper scientific conclusion, in my opinion, has been, from the very outset, that NIOSH lacks the data it needs to bound the dose in either the covered or the residual period with sufficient accuracy.

So, no, I don't accept. The co-petitioner, and I'm speaking for [Identifying information redacted], the petitioner as well, we do not accept the idea that trying to do our best, of course everybody tries to do their best with the data that's available, but the best you can do with this available data is to conclude that it's insufficient to say that NIOSH is able to reconstruct the dose and bound the dose during the residual period with sufficient accuracy. Thank you.

DR. ANIGSTEIN: I'd like to answer.

CHAIRMAN ZIEMER: Do you have a response, Bob?

DR. ANIGSTEIN: Let Dave go first.

CHAIRMAN ZIEMER: Yes.

MR. ALLEN: No, go ahead, Bob.

DR. ANIGSTEIN: Okay. Actually, what Dr. McKeel said about film badge data. There is film badge data during the residual

period because the Landauer film badge program continued right until GSI shut down operations at the end of 1973.

And during the residual period, which looks over those data also, just like during the operational period, the vast majority of film badges read M for minimal, meaning less than detection limit, which is approximately 10 millirem per week.

So with a very small number, I have here in front of me, there were three cases during this whole period of July 1st, '66 through end of '73, where you had a large number, fair number, declining, but as their work activity declined, the number declined, but nevertheless, there were -- just doing in my head what it would be, seven and a half years times 50, so you had something like 1500 weeks.

No, excuse me, that's wrong. Sorry. 350 weeks with anything from 30, 40,

50 workers per week, badges per week, and of those, there were only six which were over 100 millirem, which is where it becomes a significant weekly dose, and one of them was in error.

So there were no exposures. If there had been some high sources of exposures during the residual period, you know, they only count if a human being was exposed to them, and we always assume that the badged workers would be most likely the ones with the highest exposures.

So I think that this NIOSH assumption is a reasonable one. I mean, that's SC&A's position.

DR. MCKEEL: This is Dan McKeel. I have to respond to that because the record has got to be crystal clear. Yes, it's true, there was some film badge data during the residual period, and let's be clear how much that was and what that data represented.

There is Landauer film badge data on 108 individuals who were badged at GSI. All of those people were men who were radiographers who were either betatron operators or isotope operators. The workforce at General Steel that's included in the SEC 105 Class is at least 3000, and some of the earlier year's newspaper reports suggest that they were hiring and it was higher than that.

So if you do that arithmetic, then the film badges cannot be representative of any more than 3 percent of the workforce.

And if you further calculate, as I have done in my reports several times, that the GSI radiographers wore film badges only part of the time, and that was while they were in the betatron buildings, not, for example, while they were along the whole uranium pathway, you know, and you multiply that times the number of hours, including the hours that should have been monitored in those unbadged

workers, as we've pointed out many times, who handled activated uranium and so forth, were exposed to the cobalt sources, exposed to the radium sources, exposed to the iridium sources, if any of those people had had badges, and they should have, then that should be figured into the person hours that we're talking about, then that 3 percent number decreases to about 0.3 percent.

You know, so there is a minuscule, non-representative amount of film badge data for GSI workers in only one job category, and there were hundreds of job categories at GSI and, in fact, the doses that NIOSH, and Allen, and SC&A, and Dr. Anigstein, have come up with in 2012 show a reversal.

In 2008, their models showed that the betatron workers got the highest doses and that the layout workers, that they say represent the rest of the workforce, had far lower doses by about a tenfold difference.

Now that ratio has been reversed with new models, new assumptions, and compared to 2008, now the layout workers have the highest doses by far and the betatron operator doses have decreased by tenfold.

CHAIRMAN ZIEMER: We're getting out of the residual period.

DR. MCKEEL: Okay. I'm sorry.

CHAIRMAN ZIEMER: The residual period, it's unlikely that anybody's film badge is going to show something from uranium contamination. The uranium contamination really, as far as dose is concerned, is going to be an internal dose problem.

I can't imagine any levels that you could postulate of uranium contamination, even in the worst plants we've looked at where the external dose during the residual period is going to be the driver.

We've got to be looking here and the real issue on the residual period, I

think, is going to be internal dose and whether or not there's reasonable assumptions on the uptakes of the contamination, and that includes the resuspension and all of those kinds of things.

These external doses are going to be trivial compared to that, I would think. Dave, can you comment?

MR. ALLEN: Well, I mean, I agree. Like I said, we calculated from our surface contamination and found very little, but we were worried about that vacuum cleaner and the idea that it could be concentrated is why I used that. And like Bob said, we --

DR. ANIGSTEIN: This is Bob. I'd like to comment on one thing even though it's outside today's agenda, that's about the reversal between 2008, 2012. In 2008, we calculated doses to the layout men that were actually very close. They were competitive with the doses of the betatron operator. The

operator came out slightly ahead.

The reason for the change was, in that 2008, we did not have film badge data. The SC&A analysis was based on the most conservative assumptions about the radiation coming out of the betatron itself, about the shielding, about the work practices.

When we got to re-assess this, which we did earlier this year, the film badge data showed that the betatron workers got minimal doses. Your typical betatron worker left GSI, after however many years he was there, with minimal. Not a single film badge reading came out above M for minimal. That was a typical worker.

There was a minority of the workers, there were 23 film badge readings, two of which were due to the same worker, so there were 22 workers that had anything other than M, and of those 22, about half of them were given a single value of 10 millirem,

which is the lowest that is ever assigned.

Anything below that goes into the M category. So we, naturally, SC&A, naturally, took this into consideration, we revised our estimate, and then we went back to the layout men because during the time, even though he might have been alternating at his job as betatron operator, but during the time he was doing the layout work, he was not carrying his badge, so we assumed that there was an eight-hour-a-day full-time layout man in the worst possible location.

Then, again, we got additional information --

CHAIRMAN ZIEMER: But you've explained that before --

DR. ANIGSTEIN: Okay.

CHAIRMAN ZIEMER: -- and that's out of the residual period.

DR. ANIGSTEIN: Right. Okay.

CHAIRMAN ZIEMER: Let's stick to

the agenda here.

DR. ANIGSTEIN: Very good.

CHAIRMAN ZIEMER: Okay. So let's go on to your report, Bob.

DR. ANIGSTEIN: Okay. Well, to begin with, we've heard two reports, memos really, one, May 30th, the other one, June 8th it was released, and when I first started to review the residual period, the residual period is based on the deposition of uranium dust during the operational period.

So I went back and looked at the operational period, really, with a fresh eye after four years, and the first thing that caught my eye was a reference to Table 7.8, I believe it was, in the parent document, TBD-6000, which was issued in 2006 by Battelle.

Dave Allen made some partial revisions in 2011, so I'll refer to it as Allen 2011. The portion that I'm referring to are identical in the two documents. I just

wanted to make reference to the latest document.

And I'll admit, I got confused, because I was looking at the Table 7.8 and it was hard to get those numbers out of 7.8, and I jumped to the conclusion, wait a second, if I take this number during the 1950 to '55 period, which is stated in picocuries per day, and calculate the breathing rate and the exposure rate, I said, gee, I come up with the same numbers as in Appendix BB in dpm per day.

So I jumped to the conclusion, wait a second, they forgot to convert the units. That was an incorrect assumption, but Dave Allen came back and corrected, I looked back again, and the problem was, the reference should have been to Table 7.6, which lists the 198 dpm per cubic meter on which 7.8 is based, but it was a little hard to follow.

So going back to 7.6 it was straightforward. And actually, it had been

obvious. I had found this in 2008, and over the four years, my memory of that might have been slightly imperfect and I redid it, and, as I said, I made an error.

So that was the reason for changing that thing. Going on, but we still had other issues. We had the issue with the resuspension rate. Sorry, resuspension factor, make sure I use a different quantity, and we had made this observation.

We didn't belabor it in the review, the 2008 review, of Appendix BB because we had, at the same time, John Mauro's on the line, was the lead on reviewing the TBD-6000.

So rather than raise the same issue in two reports we simply said, this issue has been handled already in TBD-6000. And it remained a finding in the TBD-6000 issues matrix, which was never resolved because the 1 times 10 to the minus 6th per

meter remained in TBD-6000.

Dave Allen pointed out that this had been referred to, and that was correct at a slightly earlier time. Dave is just a couple of weeks behind times. That was correct that it had been referred to to the Procedures Work Group, which, Member Wanda Munn is on the phone, so she could attest to that.

And the Procedures Work Group found that the issue had been resolved in the latest version of OTIB-70 that was issued in March. And at the last Procedures Work Group meeting, it was decided that this is -- we thought, actually, Steve Marschke, who is our lead on reviewing procedures, was simply tasked with verifying that, in fact, it was resolved as the author, Mr. Sharfi, I believe his name is, of OTIB-70.

Now, OTIB-70, essentially, bounces the ball right back to the individual site

review team, you know, the site Work Group, and the NIOSH people, and the SC&A people involved for any particular site, they said it can vary and it has to be determined on a site-specific basis.

So given that, and as a matter of fact, at the very latest round, which is the latest review that I made, the memo of June 8th, is, well, since there is some uncertainty, as always, we make the claimant-favorable assumption.

And, as it happened, at the Mound site, NIOSH had agreed to use, for the inhalation of stable tritides, meaning chemically stable tritium metal compounds, they had decided to assign it 5 times 10 to the minus 5 as being a conservative upper bound.

It's not the highest number mentioned in OTIB-70. There are tables and reviews of the literature which go as high as

10 to the minus 2, but it's on the high end. It was the one that was used by NRC at one point in a document called NUREG/CR-5512 Volume 3, senior author was Beyeler, and they had proposed 5 times 10 to the minus 5.

NRC took another look at it. CR stands for contractor, so this was a contractor report. NRC issued its own report, which is NUREG-1720, so if you don't see the CR, that NUREG means that it's a staff report, even though sometimes it's written with contractor help, but it means that the NRC stands behind it.

And that one said 10 to the minus 6th, but that's only for a facility that has undergone cleanup. So all the easily removable contamination was removed. It had been swept, scrubbed, washed. If they wanted to remove all contamination they would have simply chipped away the concrete. It doesn't require it, but it's something that has been

cleaned up, and also, it's a quiet area. Nobody is stomping around, driving trucks over it, raising up dust. So during a quiescent stage, 10 to the minus 6 is a good number for a decommissioned facility.

So this would not apply to GSI. I mean, there may have been some washing, but we don't accept the fact that it was, certainly during the operational period, that this would be good. So the latest thing, which is actually an update from my earlier memo of May 30th, because I hadn't looked at the OTIB, I wasn't aware of the Mound -- the precedent that was set by NIOSH.

So to be consistent and conservative I would say 5 times 10 to the minus 5. I mean, we're just throwing it on the table. We're not taking a rigid position on this, but we're just throwing it on the table that this might be a good number to use for resuspension.

So resuspension would affect the residual period. It would also affect the exposure of workers in between betatron operations. Now, I'll go back and underline and italicize that, in between betatron operations.

During betatron operations, we agreed that the 198 dpm per cubic meter is a reasonable upper bound. This was actually measured during actual operation where there was more disturbance than would be true at GSI.

And also, I want to clarify and answer to a couple of Dr. McKeel's points about the uranium being moved throughout the plant. Sure, we recognize that, but this is a gigantic plant. I forget how many acres it was, and ten cleaning and finishing buildings, and a large number of other buildings.

The NIOSH analysis assumed that that 198 dpm per cubic meter prevailed

throughout the entire plant during the hours that uranium was handled.

Now, the uranium was not being handled in every building, even if it came in on the railway, as I recognize, and was handled on the loading dock, locally, you could have had some here, some there, some further down, it would not have been everywhere all at once.

So consequently, this, again, seemed like a conservative, claimant-favorable assumption. Now, as far as the hours, we do have an issue with that because the simple picture of half and half, half an hour for setup, half an hour for takedown, one hour for the shot.

First of all, that would not be the case even with the idea of a slice, which as I admit, most likely, it's not the only shape that was radiographed, but even with the slice, it would have required several shots.

So it would not be half an hour in-between each shot.

Also, some of the shots were shorter. There is a record of small-diameter rods at Weldon Spring being radiographed somewhere. And the somewhere, we'll assume, is GSI because I'm not aware of any other radiographic facilities for uranium in that area, so it might have very well been.

So the fraction of time inside the control room and inside the shooting room is variable. It's an uncertain number and I would suggest that we simply take the conservative approach and just say, if they worked 500 hours a year, just assume that that was for uranium handling, because the time spent by, say, the chain men loading it onto the railroad car, the little electric railcar inside the plant, may not have been figured. This may not have been.

When GSI billed Mallinckrodt, they

may very well not have included the time spent by the betatron team in setting up the shot, shooting it, and getting it out of the betatron building. My guess is they probably, Mallinckrodt and AEC may have raised an eyebrow and said, wait a second, you're charging us $16 an hour for simply transporting it from one place to another?

So it may not have included that, but it was probably not that much time. So if you make this other assumption that no time was spent in the control room, that would seem to offset any time outside the betatron building where the uranium might have been handled, not just sitting, but just handled, so that there was some disturbance.

So we think that if they simply eliminate the factor of 2, we will be comfortable with the rest of that. And let me just take another glance. I think that sums up the -- oh, yes, and the hours themselves,

we would even go slightly -- I just made the argument that maybe it should have been 500 for the early years, 500 hours or 450, when rethinking it, why not just -- since we don't know, really, what was going on during that time.

In other words, we have the '53 to the first quarter of '58, but let's just say a round number, '53 through '57, so that's five years, where we don't have firm information on the hours, and then we have '58 through '66, which is eight years, eight and a quarter, where we do have detailed data.

So 8 out of 13 years is a good sample and I would take the highest of those years, not the first, but just going back over, take the highest, because that's what we do with a lot of other data.

If you do a co-worker, we say, well, don't know what this person got because he was not monitored, but other workers were

monitored, and a conservative value would be, let's just say he got the highest dose of all the monitored workers.

It's unlikely that he would have gotten higher. That's the same thing I would say here. For those five years, give it the highest number of hours of any year covered by those purchase orders. And again, the increase is not huge. It goes from something like 337 hours to 437 hours a year, if I remember correctly.

So with those modifications or suggestions, we think that the internal dose analysis, both for the operational period and for the residual period, is reasonable, claimant-favorable, and sufficiently bounding. So that's basically our position.

CHAIRMAN ZIEMER: Okay.

DR. ANIGSTEIN: John Mauro, do you have anything to add on this?

DR. MAURO: No, you did a

wonderful job, Bob. Thank you.

DR. ANIGSTEIN: Thank you.

DR. MAURO: I think you covered everything we've been working on and talking about.

CHAIRMAN ZIEMER: Any questions, Work Group Members, for Bob? Or others have questions? Okay. Then we want to hear from Dr. McKeel. You have his document of June 1st and, Dr. McKeel, if you would, to focus, I think the issues relating to sort of NIOSH procedures, and tasking, and so on, I don't want us to get into that here.

I think that's something you will work with Ted on, but can we focus on your technical issues?

DR. MCKEEL: Yes, sir. This is Dan McKeel, can you hear me all right?

CHAIRMAN ZIEMER: Sure.

DR. MCKEEL: Okay. I'm going to focus entirely on the residual period. The

first comment I'd like to make is that, when you reviewed the papers that I had submitted. On 6/13, I submitted a four-page response to the Allen June 8th, 2012 memo, and I sent that to everybody in the Work Group; all the Work Group Members; Doctors Anigstein and Mauro, and also sent it to Dr. Neton and to David Allen.

So that comment needs to be entered on the record and it was sent --

CHAIRMAN ZIEMER: Oh, thank you. Great.

DR. MCKEEL: Okay.

CHAIRMAN ZIEMER: And the date on that was?

DR. MCKEEL: 6/13.

CHAIRMAN ZIEMER: 13?

DR. MCKEEL: Yes.

CHAIRMAN ZIEMER: June?

DR. MCKEEL: Right. Let's see. So the next point I'd like to make is, since

we were just finishing with the SC&A presentation, while I have it front of me here, on the very last page, on Page 3 of this June 11th SC&A memo, it states that in Allen 6/08, it stated that all new GSI assessments would be based on 3250 hours, so that was no longer an issue.

Well, I think the issue is that everyone has agreed on the 3250 hours, and I'm talking about SC&A and NIOSH, since the October 2007 meeting when that number was established, and it has not been incorporated into a revision of Appendix BB.

So although everybody may agree with it, and may use it in calculations and technical papers, as far as being incorporated into Appendix BB, that hasn't taken place.

CHAIRMAN ZIEMER: Right. The Work Group has also approved that and we're certainly aware of -- it's sort of an internal NIOSH thing as to when the revision will

occur. So, yes, I understand the frustration there, Dan, but go ahead.

DR. MCKEEL: Well, as I said before, it's not a matter of frustration, it's a matter of --

CHAIRMAN ZIEMER: Well, I think it is.

DR. MCKEEL: The fact is, Dr. Ziemer, that NIOSH wrote to me and said the reason that they had not revised Appendix BB by now is because they were waiting, and I presume still are waiting, this was from Stuart Hinnefeld, the Director of DCAS, that they were waiting for the Work Group to conclude its deliberations on Appendix BB issues.

CHAIRMAN ZIEMER: Right.

DR. MCKEEL: And those still haven't been clarified. And in fact, Ted Katz wrote me recently that there probably would be a meeting about resolving those, but that

meeting hasn't yet been scheduled. So anyway, moving on.

The next thing I want to talk about is the Brownfield letters that are mentioned by David Allen in his 6/08 memorandum. And the Brownfield letters refer to a payment that GSI is making for $48 to Mallinckrodt Weldon Springs.

And the idea that both NIOSH and SC&A seem to accept, or at least they didn't question in their reports, is that that purchase order refers to uranium. Well, the letters themselves don't say anything about uranium.

And what John Ramspott and I want to point out to you is that, there is, on record, a purchase order that Mallinckrodt uranium division issued to General Steel Industries for a piston rod and that would be a purchase order that they called U-83621-F, and that can be found on Page 30 of the FUSRAP

IL.28-5 report on GSI.

And that's the major report that contains all the purchase orders. So the Brownfield letters that Dave Allen refers to are on Pages 17 and 21 of that document, and the piston rod purchase order is on Page 30.

So Mr. Ramspott and I would suggest that those two letters by Brownfield, which really don't figure in the calculations, and should not, under any circumstances, be construed as any evidence that NIOSH has more data on GSI uranium shipments from Mallinckrodt prior to the first purchase order in 1958; they don't. And those letters should not be used as any kind of proof of that fact.

Okay. The second thing I want to talk about is just to remind everyone that, when we're talking about the TBD-6000, the parent document, and the slug production facility, that this is surrogate data that has to be used because there is no uranium,

surficial or surface, surveys before the 1989 ORNL survey, which we've talked about this morning.

The second this is that, ORNL, in 1989, in their reports, provides no justifications why it limited its surveys to only the two GSI betatron facilities. So except for postulating that might have been a cost-saving measure, we don't know about that.

The third thing I'd like to say is that, both the Board and NIOSH have developed discrete surrogate data criteria by which they judge the use, and appropriateness of use, of surrogate data from one site being applied to another site.

And in my comments, including the one from yesterday and the previous one, I pointed out, and previously, that there has been no justification that the slug facility was similar enough to GSI to make that a valid source of surrogate data.

And in fact, Dave Allen outlined many differences in even the type of source term, that is that the slugs were smaller, they had been cleaned of their crust and their magnesium fluoride crust, with its concentration of contaminate radionuclides, so the source terms were different and what was done with the source terms was different.

So the uranium at GSI, of course, was bombarded with 24/25 MeV betatron, which not only activated it, but also, as we've demonstrated through published peer-reviewed literature, actually caused fission, at very low levels, but caused fission of up to 1 or 2 percent of the uranium molecules.

So I just don't think those two facilities are comparable at all and I want to put on the record that we do, the petitioners, object to using the slug facility as surrogate data.

We've already talked about the

uranium route at GSI and I guess the surrogate data issue is the one that I would point to about this. I understand that the slug facility airborne uranium concentration, the air concentration, that's what's used for all the plant at GSI. I appreciate that fact.

But the point is, this blind acceptance that a value from a completely different facility, with lots of data, can just be, by fiat, applied to GSI, and that that is a sufficiently accurate bounding, and that it's a claimant favorable one. You don't know that.

And again, I point out, you can do all the reasoning you want to, all the calculations you want to, all the modeling with computer code that you want to, but you don't actually know what the airborne concentration of uranium was at General Steel Industries at any time from 1952 through 1992. So that's all I really want to say on that

point.

The fifth point I want to bring up is that, we have now had very good and thorough explanations of why SC&A believes that the resuspension factor used in TIB-70 is inappropriately low by a factor of about twofold for GSI.

And I just want to say that the petitioners agree with that sort of reasoning and believe that a higher resuspension factor should, in fact, be used for GSI. So I think that's an issue that needs to be resolved by the Work Group and by the full Board.

The other comment I want to make is that, on the last page of the first SC&A response to Dave Allen, not to Dave Allen, but just on the first reviewed memo of May 30th that SC&A wrote about this topic.

They mention the formula developed by Sharfi and the Procedures Review Subcommittee, and they mention that this

formula could be used to calculate the midpoint of the uranium levels in the air during the residual period, and that, based on that, you could provide a uranium amount in the air for each year of the residual period.

So again, this is a house of cards built on a house of cards. It's taking an assumption from two surrogate document sources, TBD-6000 and TIB-70, and coming up with a derivative formula that allows you to make a calculation of data that didn't, in reality, exist at all.

And, you know, there are recent analogies to that, I believe, in the financial world. And anyway, I think it's wrong, scientifically, and I hope the Work Group will reject that type of reasoning.

The final thing I want to say is about the last point that was discussed by Dr. Anigstein. We've talked about the use of the 3250 hours, but that number, you know, is more

solid because it's backed up by worker testimony.

There's a lot of hours calculation that are made at GSI based solely on the presence of purchase orders from Mallinckrodt uranium division. And the point that has always struck me about those purchase orders is that, in and of themselves, they really don't prove anything about uranium actual usage at GSI.

They are a purchase order. There's no confirming receipt that GSI received that amount of uranium from Mallinckrodt. There's no receipts from Mallinckrodt that GSI ever returned a given amount of uranium to them. There are no shot records of the betatron shot records, which we know existed, by which you could gauge all that.

So, you know, I think that also -- and it does reflect on the uranium mass, the

source term itself, that was present during the residual period. If we don't know, with sufficient accuracy, the source term for uranium that existed at GSI during the operational period, how could we possibly accurately know the source term mass during the residual period? And I suggest we can't do that.

So I guess that concludes my thing. I really appreciate the opportunity to address the Work Group one more time and I'll be interested in the further deliberations for the afternoon. Thank you very much.

CHAIRMAN ZIEMER: Okay. Thank you, Dan. Questions for Dr. McKeel.

DR. ANIGSTEIN: Yes. This is Bob. Three comments. One is about the Brownfield memo, which is really the same memo that was sent out twice, once in February and I think once in June, or later in the year, in the latest SC&A memo of June 8, we do make the

statement that we don't think that this is we didn't question that it was tied uranium, we just said, it does not cast any light on the usage on the monthly hours.

So I think that's a non-issue and NIOSH also did not also explicitly base its hours on that. It simply said that, maybe the hours were less.

As far as the purchase orders, these are limits. These are legal limits that said, you will not bill us any more than. The earlier ones where I said this is the estimated amount, the later one, in later years, they said, this is the limit. We're not authorizing you to do any work to exceed these purchase orders.

And being a commercial entity, there's no reason they would have done more work than they were being paid to do.

DR. MCKEEL: Dr. Anigstein?

DR. ANIGSTEIN: Yes.

DR. MCKEEL: How can you be positive that the purchase orders that exist now are all of the purchase orders that were issued? And I suggest you can't possibly know that.

DR. ANIGSTEIN: They are continuous. Starting with March 1958 going through June 30th, 1966, they are continuous.

DR. MCKEEL: I understand that, but how do you know there were not purchase orders before 1958 that we don't know about?

DR. ANIGSTEIN: Oh, no, of course. That's the whole point. NIOSH and SC&A agree that, prior to 1958, there was some uranium work being done. The only documentary evidence, besides the Brownfield memo, the February, which is just prior to the first purchase order that we have on record, there is only the cryptic one-liner, which is apparently a cover sheet to some other documents, which no longer exist, and it says,

and I'm going by memory now, regarding General Steel, or General Steel Castings, uranium ingots, something about X-rays of uranium ingots done by General Steel Castings.

And it's dated December 1953. And apparently, it's a cover sheet to a file, which doesn't exist, so that's the only evidence that work was done prior to -- you know, going back as far as 1953. And the DOE finding as part of the FUSRAP program, long before the current EEOICPA was even thought of, said that it may have started as early as 1953.

And also, just to go on record, in answer to something else Dr. McKeel's longer submission a little earlier that I believe he refers to as the 11-pager, we also made the observation that the work may have started as early as 1952. It couldn't have started any earlier because they didn't have a betatron.

But early in 1952, I found a short

notice in the New York Times, obviously based on, probably, a publicity release from General Steel, saying that this 24 MeV betatron has been installed by the Army in Granite City in January '52.

So our position has always been that '52 should be included, but since it is not up to NIOSH or the Work Group to make this determination, DOL has not acted on that, but that, you know, is one of the issues we raised in our comments on Appendix BB.

And if I can just finish up, the last comment Dr. McKeel raised about we don't know the mass of uranium. Well, true, they don't know the tonnage of the uranium ingots, but none of the analysis uses that information. It's not needed.

We simply say there was enough uranium to give us this concentration of a 198 dpm per cubic meter, because that's the highest that was recorded for this type of

operation. And the volume of the uranium is not what's at issue. It's how much disturbance is going on.

DR. MCKEEL: Dr. Anigstein.

DR. ANIGSTEIN: Yes.

DR. MCKEEL: You're replying to my comments and I've got to reply to yours.

DR. ANIGSTEIN: Excuse me? I have to reply to your comments.

DR. ANIGSTEIN: Sure.

DR. MCKEEL: Once again, let's take it in reverse order. No, what I'm saying is that, the slug facility, the surrogate data, where you get the 198 figure, is not based on GSI data at all.

DR. ANIGSTEIN: I agree.

DR. MCKEEL: It's based on data from another place --

DR. ANIGSTEIN: Correct.

DR. MCKEEL: -- that has not been shown to be similar enough, I think, to GSI.

And the second thing is, when I asked Dave Allen about the Brownfield memos, he told me that, certainly, SC&A knew about those in 2008 and pointed me to a November the 10th, 2008 Work Group meeting where, on Page 103, you, in fact, did allude to two letters that talked about shipments with Mallinckrodt that were before the advent of the purchase orders, but that's all you said.

You didn't say anything about what they were, or what the source was, or where they were from --

DR. ANIGSTEIN: Yes, but in my June 8th memo I specifically discussed the Brownfield memos.

DR. MCKEEL: Yes, I understand that.

DR. ANIGSTEIN: Okay.

DR. MCKEEL: But I'm talking about what Dave Allen told me. And then he also said that I knew about them in 2008 because my

name showed up on Page 104 of that same transcript, so I got the transcript and read, and actually, what I said on Page 104 and Page 105 amplifies what you just said about the New York Times article showing that the Army actually installed the betatron January 1, 1952.

And what I put on the record was that John Ramspott and I went over to the Missouri Historical Society, got the GSI Board minutes for 1952, '52, and it's quite clear in there that, not only did they have on record that the government built and tried to give to them the betatron, the betatron facility, and several other facilities at General Steel Industries, and that the Board, later in 1952, actually turned down the offer to accept those as a gift and take care of them.

So I think there are two good pieces of evidence that there was a betatron installed at GSI and I think it's a very

reasonable comment of yours and I think, I actually, it should actually be persuasive to the Department of Energy that, maybe, the uranium operation started in 1952 rather than 1953, but that's an issue for another time.

And anyway, I think I would just make my final comment that the purchase orders, I agree with you, they are continuous from the first one in '58 through '66, however, my comment about the lack of corroborative evidence that those amounts were actually shipped; maybe the mass term is lower.

But I'm just saying that, in and of themselves, all they are is a statement of what could be done. And I think we've all been in industry long enough that we know perfectly well that, purchase orders get modified at the last minute, a note, or a call, is made that's not recorded on paper, and that, sometimes, purchase orders are

changed.

And particularly, in an area like uranium production for nuclear production during the 1950s and 1960s, the requirements of the AEC and Mallinckrodt for that kind of work, I'm sure, was shifting all during that period.

So I just would say that purchase orders are a valuable resources, but they're not the total picture. Thank you very much.

DR. ANIGSTEIN: If I can just make a minor comment on this. As an employee of a government contractor, and being a project manager on other contracts, I can say, you don't bill the government for anything that you're not authorized to bill.

If we found that we got a contract for X number of work hours, X number of dollars, during a given year, whoops, we found that the work is going to take more time, each and every time we would have our contracts

manager write a letter to the relevant government agency's contract manager, contract officer, and say, you know, we request an amendment of our contract due to the following reasons, and this how much more.

And usually, they would agree, and we would get a new and amended contract, Amendment Number 2, Amendment Number 3, Amendment Number 4, to the contract as necessary before we could bill a single penny in excess of the authorized amount.

So those purchase orders, it could not have been done by a verbal because Mallinckrodt was working for the government. They were not going to pay GSI unless the government paid them. And they would need a paper trail. So it's highly unlikely that such a thing would have taken place without a paper trail.

MR. RAMSPOTT: Dr. Ziemer?

CHAIRMAN ZIEMER: Yes. Comments?

MEMBER BEACH: Paul, this is Josie.

CHAIRMAN ZIEMER: Yes, Josie, go ahead and then John Ramspott.

MEMBER BEACH: Okay. Sorry to cut in on you, John, I want to make two points, or ask two questions, basically, the first one is on the surrogate data issue. We haven't heard from SC&A about the comparison between the Board criteria on surrogate data, so I'm interested to hear SC&A's take on that.

And then the other one is for NIOSH, the resuspension factor being too low. On Page 3 of your report you say, in Bullet 2, that this should go back to the Procedures Work Group and the Procedures Work Group sends it back to our Work Group, so I want to hear a little bit more about that.

DR. ANIGSTEIN: John, would you answer that? The first part.

DR. MAURO: Yes, perhaps I could

weigh in. This is John Mauro. Josie, you're correct. Very often, when surrogate data has been used, especially at these AWE facilities, we usually have a separate section that says, okay, let's review the surrogate data and how it was used against a five-board criteria. We have not done that.

MEMBER BEACH: Okay. I would like to see something like that done, Paul.

DR. NETON: Paul, this is Jim Neton, I think the TBD-6000 was reviewed and approved for use as surrogate data. I mean, it's a little different here because it's based on multiple sites. It's not just a single abstraction from, like, one facility to another.

CHAIRMAN ZIEMER: Right. TBD-6000, the findings matrix on TBD-6000 has been completed and those issues are closed, and you're right, this is not a single site that TBD-6000 is based on. There's kind of a

compilation of sites, and I don't recall off the top of my head what all they were, Jim. Do you recall?

DR. NETON: I can't recall off the top of my head, but it was several different documents that were written in the early years of AEC operations.

CHAIRMAN ZIEMER: Yes. But I think in certain sense, we've assumed that the appendices under that are appropriate, but explicitly, I don't think we have established, and I think Dr. McKeel's question is certainly a valid one that, you have to, in essence, establish that the parent document is an appropriate surrogate for the appendices for which it's being used.

Keep in mind that a lot of these things occurred, sort of, concurrently, the surrogate data criteria were being developed, sort of, at the same time as some of these others. And so we have sites that were

handled in the absence of explicit surrogate data approaches and we have others that the surrogate data criteria were specifically addressed as part of the analysis.

I'm quite certain that we haven't done a surrogate data analysis for GSI relative the parent document.

MEMBER MUNN: This is Wanda. I have to comment that we have had a great deal of discussion with respect to the impression that there is something truly mysterious about uranium metal, that there are many things that are unknown about uranium metal.

This bears on the surrogate data issue. Uranium metal has been very thoroughly handled, very thoroughly studied, and very thoroughly analyzed over the last, almost, a 100 years. And we certainly do know a great deal about uranium and what its characteristics are, both physically and chemically.

There's nothing very mysterious about the uranium that is in question at GSI. That's not really in question. It's known what it is. Therefore, when we assert that there is something unusual about the "surrogate data" here, we're not really posing a question that is a valid one, simply because, this is not the kind of surrogate data issue that we normally address.

This is a simple straightforward issue with respect to what can be anticipated, what can be shown, to be exposures that can be gained from a known metal over a known period of time, and that's what's been done here.

There's nothing very mysterious about uranium. We know uranium as we know how it behaves. We know what its source term is.

DR. MCKEEL: Dr. Ziemer, this is Dan McKeel. May I comment, please?

CHAIRMAN ZIEMER: Sure.

DR. MCKEEL: Well, to Wanda Munn's

comment. I would disagree. I think there is a lot known about uranium metal, and actually, I have labored hard to get into the record that we have not addressed the Work Group, SC&A and NIOSH, have not addressed some of the key issues that really have to be researched and documented in order to know exactly what uranium came over to Mallinckrodt from both the Weldon Spring site and from the Mallinckrodt Destrehan Street site.

There is even a question about the mix of uranium that came over as ingots; as dingots. Ingots and dingots, by the way, if you look at the total chemical composition of the uranium plus the outer crust, it's different between those two.

And for Dave Allen to say the main form of uranium that was deposited on the surfaces was oxides, may not be true. I am sure that those chains rubbed off some of the magnesium fluoride crust with its contaminant

radionuclides.

Mallinckrodt and Weldon Spring, and all the other uranium production facilities, went to great lengths and did many experiments, that are documented in technical reports, to get the uranium content as pure as possible, but no matter how hard they tried, that's not possible.

You know, and there were trace contaminants that matter. Now, in a pure, fresh uranium metal ingot, you know, we know a lot about it. But then you have to know how old that was to know how those daughter products factored in and so forth.

And you can take two views. One is, you can say, all of that is unimportant and insignificant, but to say that we know all, everything, about the uranium from the Mallinckrodt Uranium Division to GSI, is simply not square with the facts.

There's evidence that they used

some recycled uranium, and that's even acknowledged in the NIOSH technical reports.

MEMBER MUNN: And no one has ever said that any of the exposures were insignificant. What I said was that they can be -- what I inferred was, that they could be bounded. We know enough about the metal to know that we can bound them and we can bound them with a good degree of scientific accuracy.

That's what NIOSH has gone out of their way to attempt to do and has, in fact, done with respect to the folks who worked at GSI.

DR. MCKEEL: Well, you get to make the recommendation, and I respect that that's your opinion, and, you know, I tried to put on the record why I do not think that's an accurate assessment, but that's where I think it needs to rest.

What the statement that you said

is that, the physical and chemical composition of the uranium sent to GSI was not in question, we know what it is. And I'm saying, it is in question, and you don't know what it is, and Mr. Thayer, who's the head of Mallinckrodt, has a table, that John Ramspott sent you, about the composition of some of their uranium products.

And the composition of it, chemically, changes from run to run, from ingot to ingot.

MEMBER MUNN: To clarify --

DR. MCKEEL: And I understand what you say that there are no significant differences, but the truth of the matter is that, if you looked at the universe of metal products in any one Class, let's say, ingots, or more to the point, let's say dingots, the direct ingot process, and you actually had a table of all the chemical compositions of each and every dingot that Mallinckrodt produced,

I'm sure you'd find differences.

You might say they're small, but I'll bet you there would differences in measured radioactivity, let's say, of a counter placed 1 inch away from the surface of the dingots. So, you know, I've seen that in many technical reports.

So to say that we have sufficient information, I guess that comes down to your definition of what is sufficient accuracy. And my overall comment that I'm going to make to the Board six days from now is that, it's amazing to me, and it is true, that the definition of sufficient accuracy is still being established, that NIOSH is charged, as one of its recommendations under the ten-year review, to further define sufficient accuracy.

So, you know, at the moment, that's a definition, operational, it's an operational definition, and it certainly varies among individual observers.

And then the final comment I have to make is, I'm not clear, from what the discussion was, but what is the answer to Josie Beach's request? And that was that she would like to know how the surrogate data criteria apply to GSI and the slug facility, and I would too.

And I don't think it's clear what the Work Group is going to do about that. Thank you.

MEMBER MUNN: I wanted to clarify on one statement. Yes, there are, in fact, differences from ingot to ingot which can be identified with finely-tuned instruments. That does not change the fact that enough is known about the activities, and the about the type of metals that we're dealing with, to be able to sufficiently bound them, and that is my point. The only point I wanted to make.

DR. MCKEEL: Well, this is Dan McKeel, I have to make one final comment.

There is well-documented AEC technical reports from Weldon Spring that show that they were alloying uranium with various alloys, uranium dingots now, that they were alloying them with various trace components.

And the point of this was to stabilize those dingots as uranium fuel elements in the Hanford reactors where you work. And they did that for several years. They tinkered with the composition and then, finally, they decided that the tinkering really hadn't resulted in a more stable product, so they went back to a more baseline configuration.

So I'm saying that, even during a two or three-year period, the basic structure of dingots changed. They made experimental dingots and some of those, undoubtedly, found their way over to GSI, although, that information is not very well documented on the record we have available to us.

But the fact that those experiments were going on, and those manipulations were taking place at Weldon Spring, is very well documented. So I really need to be quiet about this, but when comments like that are made I just must respond to them. So thank you very much.

CHAIRMAN ZIEMER: I'll make a comment here and then we're going to hear from John Ramspott. I think John's been waiting in the queue. My understanding of the TBD-6000 document is that there's a sufficient number of different facilities from which the data has been used that it purported to cover, sort of, the spectrum of the types of uranium materials, and alloys, and forms that one would find.

It certainly, in terms of the exposure rates, would be hard to imagine an alloy having a higher exposure rate than pure uranium, so an alloy, itself, would be bounded

by the pure uranium values that one would otherwise use.

All right. John Ramspott, you had a question that you were waiting.

MR. RAMSPOTT: Thanks, doctor. Yes, it was a clarification in response to Dr. Anigstein's comment that there was really no early proof of uranium work at GSI based on the purchase orders, except for one little, I think he said, sketchy letter.

And I question that because, I'm actually looking at an AEC research and development report, NYO--1358, dated October 15th, 1953, and that report clearly spells out that the pilot plant uranium from Mallinckrodt was betatron tested.

So there's definitely other proof besides some sketchy little letter. The fact that the POs don't exist from '53 to '58, I've said earlier, and I still feel positive that, if you look, the Weldon Spring plant opened in

June of '58. The Destrehan plant transferred everything out there.

When you transfer one massive plant to a wholly different plant, there's a lot of things that can happen. If you look at the purchase orders, you'll see there is actually two separate purchasing departments. So the fact that early purchase orders don't exist, I would have to say that's probably because somebody didn't look for them with the MCW documents.

And the other point, maybe today, nobody does anything for the government unless they have a PO, but I'd like to ask everybody just to keep in mind the two attachments, and I was off the phone, I had to take care of some business real quick, when you were talking about the two attachments, A, B letters, talking about some work done for 48 bucks.

All you have to do is look at

those letters and they actually say they did work for Mallinckrodt before any purchase order was issued. That's what that whole little dissertation is about, the fact that they are now trying to collect on something that was done without a purchase order.

So being in business myself, I'll guarantee you, and I had it happen person, when the manager of a nuclear power plant calls and says, I need this, I'll guarantee you their purchasing people will get on the phone, have a vendor go out with the product, and they'll take care of the paperwork later.

When an emergency happens, they don't necessarily take two weeks to cut a purchase order to get something done. I mean, I've actually had that personally happen. So at Mallinckrodt, those two letters that they were talking about earlier, are proof that it happened.

So I hope that clarifies it and,

Wanda, the type of uranium, I totally understand what you're talking about, or I think I understand what you're talking about, but Dan, I think, makes a perfect point.

There were different types of uranium that I would be more concerned with, not the chemical structure, but the size, shape, because there is a big difference in exposure when a worker works on 20 pieces of something in an hour versus 1 of something in an hour.

The exposure has to be greater because they're in there with it and that applies to GSI with the corner shots versus some slice, maybe, that does take two hours, because they are trying to go through the entire thickness of it.

The ingots, we have that document, and I have the Mallinckrodt, and I've sent this before, procedure book that shows what they were doing. They were shooting those

ingots on the corners to figure out the thickness of the crust, the slag, so they could then take it back to have it lathed off. This is a Mallinckrodt document.

This states what that's for. Well, when a worker is shooting 15-minute shots versus two hours, he's definitely in there more. It doesn't have to deal, so much, with the structure of it, is it's the time you're right next to it. You can do a whole lot more when you're doing short shots.

So I think you both make a valid point. I'm more worried about the time the workers are next to it. So thank you. I appreciate it.

CHAIRMAN ZIEMER: Okay. Well, we keep moving back into the active period, but on the residual period, we have several options today. One option is to have a motion either to agree that doses can be reconstructed or to agree that they can't.

Another is to defer action pending additional information if people believe they need more or there may be additional information that you wish to request. I don't know if the surrogate data issue is part of that, Josie, or if it's part of the main issues on the Appendix BB itself.

But let me hear from Work Group Members how you wish to proceed in terms of the residual period.

MEMBER BEACH: Paul, this is Josie. I did want to hear from NIOSH on the resuspension factor because the points in both the latest papers kind of reflect back to the Procedures Work Group and/or the Site Profile. So I just wanted to make sure I understood that, if Dave could comment.

CHAIRMAN ZIEMER: Right. And let me comment first and then I'll ask Dave or John Mauro to comment, and Wanda is also here, representing -- it's the Procedures

Subcommittee, actually, it's not a work group, but it's a subcommittee, but in any event, it was pretty well agreed that 1 times 10 to the minus 6th would only apply to periods that involve previously cleaned facilities.

And I think Bob Anigstein described it already. And we've already agreed, I think, that the 1 times 10 to the minus 6th would not apply here.

MEMBER BEACH: Okay.

CHAIRMAN ZIEMER: And the --

DR. NETON: Dr. Ziemer, this is Jim Neton. I might take exception to that characterization.

CHAIRMAN ZIEMER: Okay.

DR. NETON: I think my recollection was that we agreed on TIB-70 that there are a variety of resuspension factors, and as Bob characterized earlier, we agreed that they would be taken up on a case-by-case basis --

CHAIRMAN ZIEMER: Right.

DR. NETON: -- because the situations are very different among the different plants. And it didn't necessarily determine that the 1 times 10 to the minus 6th would only be applicable to the facilities that had been cleaned.

CHAIRMAN ZIEMER: Well, okay. I should I have stated it in the --

DR. NETON: That has been SC&A's position all along.

CHAIRMAN ZIEMER: Right.

DR. NETON: But we take exception to that. I think that --

CHAIRMAN ZIEMER: Oh, I got you. Okay.

DR. NETON: I think where this thing lies right now, Josie, is that the 1 times 10 to the minus 6th is debatable. SC&A has stated their position, but we believe that there are interpretations of these NRC

documents that we can go through and demonstrate that it's applicable here.

And this, in my opinion, becomes a Site Profile issue for this particular, you know, site. You know, I think everyone agrees there is some number that's valid. It's what is the valid number, and I think that we would be willing to discuss this at the Site Profile level, whether it's 1 times 10 to the minus 6th or 5 times 10 to the minus 5th or some other value.

I think there are NRC documents out there that talk about aged facilities, where uranium has been present on the ground for a period of time having this same resuspension factor.

So anyways, I think we need to take that up and discuss it further.

MEMBER BEACH: Thank you.

CHAIRMAN ZIEMER: Okay. So 1 times 10 to the minus 6th, it's not that it

wouldn't necessarily apply in this case, but that it certainly can be applied in cases where it's already been cleaned. I think we've agreed to that.

DR. NETON: We did agree to that, but I think in this particular instance we would just like further justification for our use of this value.

CHAIRMAN ZIEMER: Right.

MEMBER MUNN: And the discussion is easily referenced in the Procedures Subcommittee's discussions of the last two meetings.

CHAIRMAN ZIEMER: But it would have to be established for this facility that that would assume that it was agreed that this could be bounded and then it would be an issue of, what's the correct resuspension factor?

DR. NETON: Correct.

CHAIRMAN ZIEMER: Okay. Who had a comment? Bob Anigstein?

DR. ANIGSTEIN: Yes. Well, I just wanted to answer Jim's comment. He said NRC would discuss this. Here's a direct quotation from NUREG-1720, which is an NRC report referring to the 10 to the minus 6th.

It says, it is assumed that surfaces will be cleaned or washed during decommissioning. This will remove most of the loosely bound and some of the more tightly bound particles. Following the above discussion, surfaces that have been cleaned will be expected to have a smaller resuspension factor than surfaces that have not been cleaned, given the same level of contamination.

So it specifically limits this to decommissioned facilities that have been cleaned up.

DR. NETON: I don't disagree with that statement, but we could take this up at another event, I think --

DR. ANIGSTEIN: Okay.

DR. NETON: -- but I've gone through all the -- Dave Allen and I have looked at all the studies that they refer to and I think that there's room for interpretation. That's all I'm saying.

DR. ANIGSTEIN: All right.

CHAIRMAN ZIEMER: Any other comments?

DR. ANIGSTEIN: Yes. I'd like to make a couple of comments on this last part of the discussion. Dr. McKeel and John Ramspott, and that is --

CHAIRMAN ZIEMER: Are you discussing the residual period? I don't want to get back --

DR. ANIGSTEIN: I withdraw my comment.

CHAIRMAN ZIEMER: Yes, okay.

MEMBER BEACH: All right, Paul, this is Josie. I think I still need to hear

more on the use of surrogate data from the slug facility. I'm not a 100 percent clear on that.

CHAIRMAN ZIEMER: Okay. And the implication for you on this issue of the residual period is to delay action on it? Is that --

MEMBER BEACH: For the residual period, yes, because it's my understanding that it's all surrogate data based on OTIB-70 and 6000, and I just want to be -- I'm just not quite clear on how those two meet with the criteria that we had set up. So that's just me.

CHAIRMAN ZIEMER: Yes. That's fine. Are you making a motion to defer action on the residual period?

MEMBER BEACH: Yes, I believe I am. I will say that I would like to wait until I see some more on that topic.

CHAIRMAN ZIEMER: Okay. There's a

motion. Is there a second?

MEMBER POSTON: Paul, I'll second it so we can discuss it.

CHAIRMAN ZIEMER: Okay. So a motion is to defer action on the residual period. Now, the effect of that would be, when we report to the Board next week, we would have a report on Work Group actions on the active period and then actions on the residual period.

Now, the Work Group simply brings recommendations. The Board is not obliged to accept our recommendations one way or the other. They may choose to defer everything. They may choose to vote on everything. All this would be, would be a recommendation and I guess, Josie, is the motion passes, the Board would spend additional time on the residual period as well as dealing with other issues on the main Appendix BB site profile, or Appendix BB document.

MEMBER BEACH: Absolutely.

CHAIRMAN ZIEMER: Other comments? Ted, did I state that correctly from a, sort of, a procedural point of view? The Board can do as it wished on this.

MR. KATZ: Yes. I mean, the Board trumps the Work Group in any event. Yes.

CHAIRMAN ZIEMER: Now, it's probably unlikely that the Board would go ahead and act if the Work Group recommended deferring action on this and there are cases where, and in fact, any number of cases where we've dealt with the residual period separately from the main period on a petition, isn't that correct?

MR. KATZ: Yes. I mean, normally, the Board waits and lets the Work Group complete its work. And where a Work Group is asking to do more work to resolve an issue, I mean, the Board has always respected those requests from the Work Group. In fact, I

suspect it would in this case too.

DR. ANIGSTEIN: This is Bob Anigstein, I just want to make one comment, and that is, the question of the -- I mean, I'm not sure that this is, you know, my proper place to comment on this, but what we're really talking about is the intake of uranium dust, the internal. I mean, there is a small external dose during the residual period, but it's a very, very minor part of the total dose in any dose reconstruction.

And if there is uncertainty about the internal dose, about the intake of uranium, it would have a much more of an effect on the operational period than on the residual period.

All of the uranium source term in the residual period is based on assumptions about the uranium contamination levels and the uranium air concentration during the operational period.

So I just want --

CHAIRMAN ZIEMER: Well, that's correct and I think that, for the residual period, and maybe Jim Neton, or Dave Allen, can help me on this, but I think that it's only the inhalation that would deliver any, sort of, I don't necessarily want to call it significant, but compared to external, it's the inhalation, and certainly, even much greater than ingestion, would be orders of magnitude greater, I would think, than the other two components, is that not correct?

DR. NETON: That's correct for the residual period, but I think what Bob is pointing out, which is --

CHAIRMAN ZIEMER: Yes, I understand that, but on the residual period, the only issue is inhalation.

DR. NETON: It's the key issue I think. Yes.

MEMBER BEACH: So you're saying

there would be no ingestion during that time period; or limited?

CHAIRMAN ZIEMER: Well, I think even if you postulated ingestion, and you certainly would, and also external exposure, those numbers are going to be orders of magnitude less than you would get from, I think, inhalation whatever number you selected for the contamination level.

DR. ANIGSTEIN: Yes, this is Bob, I've reviewed a number of the dose reconstructions, and in all cases, the ingestion dose with the current NIOSH methodology is about two orders, just off the top of my head, two orders of magnitude, typically, factor of a 100, or maybe even smaller, than the inhalation.

Assuming the same source term, assuming the same amount of activity, uranium activity in the air at resuspension, it is a much, much smaller quantity. So I personally,

when I reviewed these, I even stopped paying attention to ingestion because, no matter what it is, it's not going to affect the dose reconstruction.

CHAIRMAN ZIEMER: Other comments? We have a motion on the floor to defer action on the residual period, for the Work Group to defer action today. Okay. No other comments. Are you ready to vote?

MEMBER POSTON: Paul, I still need some clarification. I know we've been going around and round, but I guess the question is, what's going to happen and who's going to make it happen if we go to the Board next week and say, we deferred action.

Ted says they can override us but they're unlikely to. So does that mean we're going to do it ourselves?

CHAIRMAN ZIEMER: Well, that means at our next meeting, I mean, we still have work before us regardless, just on -- let's

say the Board decides that there either would or would not be an SEC, we still have to resolve the issues on the TBD-6000 Appendix BB, the main document, because you always will have dose reconstructions.

Even if you had an SEC, you have to do dose reconstructions for people who don't get one of the specified cancers or who don't meet the 250-day criteria.

If there is no SEC, you still have to do that, so we still have work to do and all this would do would be to keep the residual period open for further discussion and maybe resolution of the question that Josie raised as to, I think, the question of whether or not there's a surrogate analogy that's correctly applied here, I guess, was the question, right, Josie?

MEMBER BEACH: Yes. That's pretty close. So just to be clear, Paul. We've got two periods. The operational period is going

forward to the Board. The residual period is in question. Is that correct?

CHAIRMAN ZIEMER: That's correct.

MEMBER BEACH: Okay.

MR. KATZ: This is Ted. Paul?

CHAIRMAN ZIEMER: Yes.

MR. KATZ: Okay. I want to make certain I was off mute. I'm finding myself a little bit confused about what's the thinking here, and this is just to amplify what Bob just raised.

I mean, if there's an issue about the use of surrogate data here, I'm wondering if, one, if you can't actually hash it out now, because you've been involved in the TBD-6000 review, actually, there's quite a lot of discussion already, and knowledge, with respect to the basis for that, and you have Jim Neton on the line, he knows quite a lot about that too.

The reason I raise that question

is because, if you have a question about the surrogate data, the surrogate data is applied during the operational period as well as the residual period. I'm misunderstanding, I guess, if there's a reason to distinguish in terms of addressing surrogate data.

CHAIRMAN ZIEMER: Well, I guess this issue just has come up. I can't say beyond that. You know, a question's been raised as to whether or not this is appropriate.

MEMBER BEACH: And meets the criteria that the Board set up.

DR. MAURO: This is John Mauro. Maybe I can help out a little bit here. It would always be convenient to be able to separate the operations period and, of course, then the Board and the Work Group could recommend an SEC, because I know that's before us on the operations period. And then separate that and the residual period from

that, but we have a little bit of, unfortunately, a monkeywrench in this. The methodologies, the assumptions that were used to do the residual period, and Bob, please clarify, are also used in the in-between times during the operations period.

CHAIRMAN ZIEMER: Exactly.

DR. MAURO: And so you have resuspension going on with the surrogate data during operations. So, in a way, you really can't parse them cleanly. So if you're going to speak about the operations period, and, of course, we've addressed many, many SEC issues and the Board has actually come to a position regarding the operations period and the various external exposures, but what we have before us now is that the resuspension issue of surface contamination is an exposure part of the operations period also.

Now, that being said, the question becomes, can it be resolved over the phone

now? That is, because it does have play, not only during the residual period, but it also has play during the operations period.

And all I can say is this: that TBD-6000 offers up a whole menu of exposure scenarios associated with the handling of metal, uranium metal. A whole range of them. And it is a judgment call which of those scenarios are best suited as a surrogate for any particular facility where you don't have the airborne data and you could go to one of the more extreme scenarios.

I have to say, off the top of my head, I don't recall whether slug machining is one of the higher scenarios where you're really generating lots of aerosols. I suspect it might be.

DR. ANIGSTEIN: No.

DR. MAURO: No? I'm wrong?

DR. ANIGSTEIN: No, it's not.

DR. MAURO: Okay. My apologies.

And I'm not trying to draw conclusions here. What I'm trying to say is, though, I think the issue that's in front of us is, do we have an SEC issue in front of us with respect to surrogate data? Yes, this is surrogate data. This draws from TBD-6000.

TBD-6000 has been thoroughly vetted and has all been agreed that the sweep of operations on uranium metal have been exhaustively studied by a very large amount of data which captures the full range of kinds of activities that could have taken place to generate an aerosol.

And so one could argue, since that's been vetted, and it's been agreed, that somewhere in that distribution you could find a bounding scenario that applies to your circumstance. One could argue, then, the surrogate issue has been resolved. It's just a matter of picking the right scenario.

So one could argue, well, then

it's not an SEC issue. We may disagree that the slug handling is the most limiting, but we probably, certainly could find one that is more appropriate and more bounding.

So in one respect, the person could argue, well, it's not an SEC issue because of that. On the other hand, until you actually do that, and in this respect, I would be saying something that would support with Josie, well, until you actually do that, you haven't really put the surrogate issue to bed.

So I mean, what I'm trying to do, as best I can, is show both sides of the judgments that have to be made at this time.

CHAIRMAN ZIEMER: In principle, if one were to say that the uranium slug scenario is inappropriate, you could select a different one on a TBD-6000, because I don't recall where the slug thing was in terms of air concentrations, but certainly it wasn't the highest.

DR. ANIGSTEIN: No, Dr. Ziemer. Actually, it's the lowest.

DR. MAURO: Oh, okay. It's one of the lower ones. And, Paul, you're right. So the question is, well, let's say, in the end of the process one judges that, well, perhaps there's a more appropriate, more limiting -- so, I guess, here's the question, since we've already agreed that TBD-6000 does establish boundaries on airborne dust loadings associated with the handling of uranium for virtually every circumstance we might encounter, and that's why it was reviewed, to see, does it do a good job in accomplishing that.

On that basis, one could argue that, all you really have is a site profile issue, to pick the right one within that range. So that would be one side of the argument. The other side would be, well, until you actually do that, it might still be

an SEC issue.

And I think that's the question that's before the Work Group at this time.

CHAIRMAN ZIEMER: Well, previously, we had agreed that the TBD-6000 approach would bound the airborne activity for the active period.

And in principle, if you say that, then you would say, then it also will apply in the residual period, and then it's a matter of selecting the correct resuspension factor, which is, you know, it could still be debated, but at least, in principle, you can reconstruct dose with that approach.

And if we opened the residual period and say we're not prepared to make a recommendation, I guess, Ted, you're asking, does that, in principle, say then, why could you do it for the active period?

DR. ANIGSTEIN: This is Bob. If I can comment. Just, perhaps, to refocus. The

residual period does not directly use surrogate data from TBD-6000. What is used is -- the air concentration that's listed in TBD-6000 for the slug production operator is used, then, to calculate the deposition on the surfaces.

Then it is assumed that the highest year based on the maximum number of hours in a given year for uranium handling, assuming that whatever gets deposited during that year, then it remains constant from that year, which is, I think, 1961 through 1993.

So it's simply, whatever is deposited, using the TBD-6000 numbers for the deposition rate, then remains on the ground, on the floors and continues on. So the two are inseparable. If you accept the surface concentration during the operational period, then it simply continues during the residual period.

CHAIRMAN ZIEMER: Right. Right.

And what I was saying was, sort of, in reverse, if you don't accept it for the residual period, why did you accept it for the active period? Yes.

DR. MAURO: Yes.

DR. ANIGSTEIN: Exactly, agree.

DR. MCKEEL: Dr. Ziemer?

CHAIRMAN ZIEMER: Yes.

DR. MCKEEL: I know this is not my time, so to speak, but I really would appreciate being able to put a short sentence on the record.

CHAIRMAN ZIEMER: Sure.

DR. MCKEEL: And that is, this is not the first time that I brought up about the inappropriateness of the slug facility and the use of surrogate data related to that facility. Now we've learned that the amount of airborne uranium from that facility was one of the lowest, or lowest, of the scenarios in TBD-6000.

My previous comments were really made in conjunction with the operational period and I think it would be fair to say, as has been confirmed this morning, that although that subject has been brought up, that no other TBD-6000, Class 6001, or TBD-6000 Work Group Member has ever called for a formal comparison to see whether the slug facility meets the Board's surrogate data criteria.

So, you know, of course, I applaud the idea of doing that. I think it's absolutely necessary. And, you know, I think all the comments made by Dr. Mauro just now, and Dr. Anigstein, point to the fact that the surrogate data issue transcends the period and stretches all the way from 1952 to 1992.

So I strongly encourage that that needs to be done and that that be factored into the equation. Thank you.

CHAIRMAN ZIEMER: Thank you. Board Members, any other comments? Okay. So

we have a motion to defer action on the residual period. Are you ready to vote? I guess we need to do it by roll call, Ted. Ted, are you on there?

MEMBER BEACH: He's probably muted.

MR. KATZ: I am. Thank you, Josie.

MEMBER BEACH: You're welcome.

MR. KATZ: If I could get us to vote with a very good roll call. Okay. Now, let's do this again.

Dr. Poston.

MEMBER POSTON: Yes.

MR. KATZ: Okay, so that's a yes to deferring. Okay, and then Ms. Munn.

MEMBER MUNN: No, I think we've covered that previously.

MR. KATZ: And then Ms. Beach.

MEMBER BEACH: Yes.

MR. KATZ: And then Dr. Ziemer.

CHAIRMAN ZIEMER: I guess I'll vote to defer. I don't know that it accomplishes anything at this point, but I'll try to accommodate here the concerns of our fellow Board Member. So I guess the motion carries then, correct?

MR. KATZ: Yes. The motion carries. That's three votes in favor.

CHAIRMAN ZIEMER: Okay. So I will report to the full Board that we're not ready to make a recommendation yet on the residual period.

MEMBER BEACH: And will we see some work on this surrogate data issue, Paul? What's the thought there?

CHAIRMAN ZIEMER: Well, you know, we'll have to schedule a Work Group meeting later in the summer after our Board meeting is over and then we'll have that on the agenda. I don't know at this point, I need to look at this, but I don't know if we need to -- got to

think about this, well, I guess, let's find out what the Board wishes to do at this point.

But I think what we'll need to do, and the full Board can task this, I think we may need to ask SC&A to look at that issue. Is this an appropriate surrogate for GSI? Ted, is that something we can task at the meeting?

MR. KATZ: Yes, we can task it now or at the meeting, but since you're going to end up discussing this at the meeting anyway, we'll task it at the meeting. Unless something unexpected happens at the Board level, even if you don't state it at the Board meeting, I'll make sure that this is tasked immediately after.

And certainly, SC&A is not going to get to this before the meeting, so there's no real reason to task it right now.

CHAIRMAN ZIEMER: Right. There's no time to do anything between now and then

anyway.

MR. KATZ: Right. I think so.

DR. NETON: Paul, this is Jim. I've got a question. I'm a little bit confused as to what is going to be the Work Group's position on covered period now?

CHAIRMAN ZIEMER: I think that nothing has really changed on the covered period. I mean, intrinsically, it appears that it has, but we've only taken this action on the residual period right at the moment.

DR. NETON: Well, I'm not sure how you can do that because, like, as Bob pointed out, they're inseparable. If the conclusion comes to be that it's inappropriate use of surrogate data, it affects the covered period as well. I mean, they're the same thing. I don't know, I guess I'm confused as to how one would --

DR. MAURO: Jim, I agree with you. This is John.

DR. NETON: I don't know how you can take two different positions when the same issue appears in both pieces.

MEMBER MUNN: Exactly.

CHAIRMAN ZIEMER: That's exactly right.

DR. ANIGSTEIN: If I could make a suggestion, this is Bob, perhaps since I spoke up about saying that the slug production is the lowest concentration of the ones that were considered here, the reason they used slug production is that every other operation, and perhaps Dave Allen can clarify this in more detail, involved much more disturbance of uranium.

I mean, there's just a list of these in summary on the tables. It's not a long list. Extrusion, rolling, forging, machining, and scrap recovery. So each of these, I believe, NIOSH considered involved actually roughing up the uranium, certainly

machining, whereas, the slug production involved the least amount of handling and is closest to what happened at GSI, where there was no disturbance, except inadvertent, as Dr. McKeel pointed out, putting the chains on.

So when I said it's the lowest, we did not question. We did review this, originally, as part of our Appendix BB review, and we agreed that this was a limiting scenario, if anything, it was a conservative scenario because it probably involved more disturbance of the uranium than was used.

And then furthermore, NIOSH now used, again, in the slug production, and you have four categories of workers, depending how close they were to uranium: operator, general laborer, supervisor and clerical.

And basically, the same air concentration, but said, well, the operator is there eight hours a day, the general laborer goes in only half the time because he has

other work, the supervisors are even less and the clerical is even less.

So there was a very good rationale. You know, we're talking about tasking SC&A, I should be saying, gee, don't give us any more work, but at the moment, we can say, we did review this issue. We can certainly do more reviews on it, but it has not been left untouched, unquestioned.

And, you know, as has been made clear, we had a number of comments, issues, criticisms of NIOSH's methodology and assumptions about the operational period, and those were primarily external doses, this wasn't one of them.

We thought that this was a reasonable assumption. If anything, it was a very conservative one, but was based on the data available, the studies they have made, this was the best. This was the most suitable and claimant-favorable.

DR. MAURO: This is John, I think we're asking the right questions here. Dr. McKeel brought up a point that says, well, I think it may very well have been roughed up a bit, perhaps roughed up in a way that might have been of a different nature and different type than, let's say, the way the slugs were handled, okay?

So let's assume that for a minute. We don't know for sure. We haven't aired it out, but the real question, this goes toward whether or not you could address the SEC issue for the operations period at the Board meeting or does this prevent you from being able to do that until you get resolution.

I would argue, and I'll do what I often do, but when we looked at the range of activities that are embraced by TBD-6000, and Bob just alluded to it, it's all coming back to me, one could ask the question, could you conceive of the possibility that we can't find

one of those scenarios which we believe to be plausibly bounding as applied to GSI?

Okay? Now, here's where I will gladly stick my neck out, because I think it needs to be done, I am very close with what's going on in GSI, I am very close with TBD-6000, and I could say with a high degree of confidence that you can find a scenario within the full range of scenarios, and not only the kinds of things they did, but the class of workers, the matrix, that would bound the operations and circumstances that, I understand and I'm familiar with, took place at GSI.

If you accept that, and I fully understand why you may not want to accept my making such an outrageous statement at this time, and just leap to a conclusion, I find that, you know, my sense is, because I have been working so close to this, my belief is that we're dealing with a site profile issue

is, the boundaries are there, did we pick the right boundary?

But you certainly could find one and as I said, I know I'm sticking my neck out a bit, but I feel as though I can, because of how much time I've spent on both these subjects.

Now -- because I am concerned that, unless I said what I just said, it's very possible that it's not going to be possible for you to address the SEC issue, which we've been waiting for a long time, on the operations period, unless I made the statement I just made.

CHAIRMAN ZIEMER: Well, in essence, if we defer the residual period, then we almost have to defer the main period as well because they are -- it's one or the other. We either can or we can't and if there's a question about whether you can do that and use this as a surrogate, you know, my

own feeling is that, if one decides that it's a different scenario, you can select a different one, but it can be bounded.

DR. MAURO: Does that make it an SEC issue which would prevent the Board from making a judgment on whether to grant or deny the SEC?

CHAIRMAN ZIEMER: I mean, you can still go back and see if you selected the right, if you want to call it, surrogate from TBD-6000. You can still do that either way. I mean, you can still recommend an SEC for the residual period and still examine what value you're going to use.

But if we say that, I think Jim Neton is quite correct that, you can't have it both ways. You know, you can't recommend going ahead on the main period and not recommend going ahead on the other based on this issue. So that's the dilemma.

MEMBER MUNN: This is Wanda. I'm

sorry I didn't speak sooner when we were debating prior to calling a vote, but the reason that I voted no is because this issue, in my memory, was well vetted when we addressed the original TBD-6000 document.

And it has the feel to me of re-invention. It isn't as though we haven't been here before and my memory was that this was satisfied, accepted for our purposes and the Board's use.

CHAIRMAN ZIEMER: Any other comments?

MR. KATZ: I'll just note, and of course, it's just a matter of procedure. I mean, you can take another vote on the matter you just voted on as well, if you want to think differently about it, having heard from John.

CHAIRMAN ZIEMER: Well, and we could also recommend deferring action on the SEC till later as well.

MR. KATZ: Right. Indeed.

CHAIRMAN ZIEMER: As a matter of, sort of, practicality for the Board, and particularly for the new Members, there's a lot of material to absorb and one would wonder whether or not the Board is going to be ready to vote in any event on this issue; on either the active or the residual period.

MEMBER BEACH: Well, Paul, I'll step out and make a motion that we also postpone the operational period, but I do believe that we need to take a full time to review this before the Board. So my motion is to postpone the operational period as well as the residual.

CHAIRMAN ZIEMER: Postpone action.

MEMBER BEACH: Yes.

CHAIRMAN ZIEMER: In other words, we would bring to the Board the findings to date but recommend that action not be taken at this meeting. You're making that as a motion?

MEMBER BEACH: Yes. Well, we can clean it up and just say my motion is to delay the operational period as well as the residual, so just operational.

CHAIRMAN ZIEMER: Delay action --

MEMBER BEACH: Delay action, yes.

CHAIRMAN ZIEMER: All right. Is there a second to that motion? I'm not hearing a second.

MEMBER BEACH: No.

MEMBER POSTON: Paul, I second --

CHAIRMAN ZIEMER: We do have a dilemma, though, that --

MEMBER BEACH: Dr. Poston was --

CHAIRMAN ZIEMER: Yes, John.

MEMBER POSTON: Yes, I'll second the motion so we can get out of this dilemma.

CHAIRMAN ZIEMER: Okay. The motion has been seconded. So we would proceed and present everything, but recommend that action not be taken on the SEC at this

meeting. That would give us time to resolve any open question on this issue of what you might call a surrogate data issue as it applies to both the residual period and the operational period. Is that the motion?

MEMBER BEACH: Yes.

CHAIRMAN ZIEMER: I mean, the motion doesn't have to say anything about the surrogate data part, it just says that we're not recommending action at this meeting.

MR. KATZ: This is Ted, and I think whether it's in the motion or not, I would think you would want to explain to the Board the surrogate data issue, where it stands, and that that's the basis for your recommendation.

CHAIRMAN ZIEMER: Right. Even though, in principle, we covered that on the operational period, but it's sort of been reopened, I guess you'd have to say. Okay. Any other comments? Anyone want to speak

against the motion?

MEMBER MUNN: I'll speak against the motion simply because I do believe we are revisiting material that we have addressed in other places and we're getting into a do-loop here. Everyone wants to move forward with this and have a definition on it, and yet, we repeatedly ask for additional opportunity to review data that we have.

It just seems to me that we're in a do-loop. So I speak against it.

CHAIRMAN ZIEMER: Okay. Anyone else? Okay. Let's vote. This is to recommend that no action be taken on the SEC petition at this meeting.

MR. KATZ: Right. So, Dr. Poston?

MEMBER POSTON: Yes.

MR. KATZ: Ms. Beach.

MEMBER BEACH: Yes.

MR. KATZ: Wanda Munn.

MEMBER MUNN: No.

MR. KATZ: And Dr. Ziemer.

CHAIRMAN ZIEMER: Yes.

MR. KATZ: Okay. The motion passes, three in favor. So there will not be a recommendation for action on this SEC by the Work Group.

CHAIRMAN ZIEMER: Okay. I believe that concludes our business for today. Any other items that need to come before us?

MEMBER MUNN: None here.

CHAIRMAN ZIEMER: If not, we'll see you all next week at the meeting in Santa Fe. Thank you very much. We are adjourned.

(Whereupon, the above-entitled matter went off the record at 11:41 a.m.)