U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICESCENTERS 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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FERNALD WORK GROUP

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THURSDAY MARCH 15, 2018

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The Work Group convened via teleconference at 1:00 p.m. Eastern Daylight Time, Bradley P. Clawson, Chair, presiding.

PRESENT:

BRADLEY P. CLAWSON, Chair
PHILLIP SCHOFIELD, Member
PAUL L. ZIEMER, Ph.D., Member

ALSO PRESENT:

TED KATZ, Designated Federal Official
NANCY ADAMS, NIOSH Contractor
BOB BARTON, SC&A
MILTON GORDEN, SC&A
STU HINNEFELD, DCAS
KAREN KENT, ORAU Team
JENNY LIN, HHS
MARK ROLFES, ORAU Team
MUTTY SHARFI, ORAU Team

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

(1:00 p.m.)

Welcome and Roll Call

MR. KATZ: Why don't we get started with the preliminaries. I'm assuming that we have other folks from NIOSH and SC&A on the line already. This is the Advisory Board on Radiation and Worker Health, the Fernald Work Group. And we're dealing with wrapping up some Site Profile issues.

The agenda for today's meeting is posted on the NIOSH website under the DCAS program's web page, under the Board section, schedule of meetings, today's date. And you can go there and pull up the documents that are primarily going to be discussed today if you wish to.

I'm going to run through roll call then. Well, I have my Chair, Brad Clawson. And none of my Board Members have conflict with Fernald, so I don't need to, they don't need to address that.

But Brad Clawson's my Chair. He's on

the line. And Paul Ziemer, one of the Members, is on the line, Dr. Ziemer. And we should be joined by Phil Schofield soon. Let me --

MEMBER SCHOFIELD: I'm on the line.

MR. KATZ: Oh, great. Hey, Phil. So, that's our Work Group Members. And let's go on to NIOSH ORAU folks. And please address conflict of interest as well.

(Roll call.)

MR. KATZ: And before we get actually rolling, Brad, I think Stu has a note to make about the agenda based on what materials NIOSH has ready, more ready.

MR. HINNEFELD: Yes. Thanks, Ted. I was able to send to the Work Group Members and SC&A earlier this weeks some responses to SC&A clarifying questions 2, 3, and 4, Topics 2, 3, and 4. But not able to send one on Topic 1 yet.

Now I think we're prepared, I'm prepared to talk about Topic #1 for a while. But I think for the purposes of the agenda it might work better if we held #1, Item #1 until the end of the agenda, and start it on Item #2.

MEMBER ZIEMER: Stu, did you send those out just at the CDC addresses?

MR. HINNEFELD: Yes, I'm sorry, I only sent it to the CDC addresses.

MEMBER ZIEMER: All right. I can't get into my CDC account because my ID card has expired. And I haven't been able to get to Cincinnati to get a new card. So I can't get into my CDC account.

MR. HINNEFELD: Okay. Hold on, Paul, and I will -- well, they're at, they're on the website. They're --

MEMBER ZIEMER: Oh, they are on the website. Okay. I'll just look there. That's fine. No problem.

MR. HINNEFELD: They're on the website for today's meeting.

MEMBER ZIEMER: Great. Okay. That's good.

MR. KATZ: Okay then, Brad.

CHAIR CLAWSON: Okay. I'd like to welcome everybody today to the Fernald Work Group. It's been a while since we've met. So,

from what I took, Bob, it's not going to be with us today. So, do you want to start off with this? Or does NIOSH want to start with their side of it?

MR. BARTON: Well, I can certainly start off. And since Stu wanted to indicate that the first item, which was the raffinate material, maybe would be best to leave for the end of the meeting for discussion, we don't have necessarily formal responses on that yet.

So that would leave us with -- and by the way, is anyone on Skype that can see the agenda I threw up there as sort of a test? Does anyone have Skype open that can verify that the agenda's up there?

MR. KATZ: I have Skype. I have Skype on. And right now I'm just seeing a black screen.

MR. HINNEFELD: This is Stu. I have it on as well. And I don't see anything on there. Just a black screen.

MR. BARTON: Okay. Let me --

MS. ADAMS: It was working earlier.

MR. BARTON: Oh, okay. Well anyway,

let's, what I'm going to do is, I'll throw up the most recent NIOSH responses to, starting with the recycled uranium. And we can start there and move forward.

And then we can circle back to the raffinate issue, which is still sort of being worked on. So, let me just see if I can get that up there.

MR. KATZ: While you're doing that, Stu, I don't think I was copied on what you sent out to the Work Group. Or if I was it went into some black hole.

MR. HINNEFELD: Okay. It's what's on the website is our responses.

MR. KATZ: Okay.

MR. HINNEFELD: But, I mean, what's on the website is actually, there were a couple of typos that were corrected. So but it's --

MR. KATZ: Okay. I just need for my records, at some point, if you would send me the email.

MR. HINNEFELD: Okay.

MR. KATZ: That would be great.

MR. HINNEFELD: It was only a couple of days ago, I know.

MR. KATZ: Yes. For some reason it either fell through a hole or -- because it isn't anywhere in my email system. But --

MR. BARTON: Okay. Does anybody see anything right now? I actually, I was going off the Word document. I can pull it off the website instead. But, Stu, are there any real, besides a couple of typos, are there --

MR. HINNEFELD: There's no difference between what I sent and what's on the website.

MR. BARTON: Okay.

MR. HINNEFELD: There, and Bob, I can see the --

MR. KATZ: Yes.

MR. HINNEFELD: -- document now on Skype.

MR. KATZ: Yes. It's up on Skype.

Recycled Uranium Constituents

MR. BARTON: All right. Great. So we're going to start with the recycled uranium issue. And just to give sort of a brief back

story on this.

Essentially we're looking at, or were looking at two periods. There's 1961 to 1972, and then 1973 on. Today what we're talking about is that former period from '61 to '72.

This issue, the discussions on this issue obviously go back a long way. I think a lot of it was sort of already wrapped up in 2011 when a set of default contaminant concentrations for plutonium, neptunium, and technetium were agreed on.

And for that period in the earlier one they were originally 100 parts per billion plutonium, 3,500 parts per billion neptunium, and 9,000 parts per billion technetium.

Since that time, from way back in 2011, the internal TBD for Fernald was revised. And what we noticed in there is that the default levels for that time period had gone down pretty significantly.

Plutonium went from 100 parts per billion down to ten. Neptunium dropped by pretty much an order of magnitude. And the technetium

dropped by about one-third.

So this, the change was discussed this past July, in 2017. And NIOSH had stated that, you know, originally they kept the original 100 parts per billion plutonium as sort of an administrative decision. Because that's how dose reconstructions had been performed to date.

However, during that period they took another look at recycled uranium operations, and the available data in that earlier period, and found that the, you know, vast majority of recycled lots that were received prior to 1973 were actually much less than ten parts per billion. And so ten parts per billion was considered a bounding value.

I'd also note that during those July discussions NIOSH also acknowledged that some of the processes that concentrate the contaminants in RU were still going on in that earlier period, in particular the magnesium fluoride metal reduction process but felt that those operations would be in short duration, you know, not over a full year. So if you applied the default for a

full year, it would cover any sort of short-term operation that might have potentially higher defaults.

And this position was echoed in the matrix update, which was issued in October of 2017. And basically that said that, well, you know, we take a look at what RU data we have, which is from a DOE Ohio Field Office report from 2000 and that 95 percent appear to be less than one parts per billion. Not even ten, but less than one parts per billion. And the remaining data points were still mostly less than ten parts per billion.

So we looked at that response and came up with these clarifying questions, which are posted on the website. And it essentially boiled down to three things.

First, we at SC&A, we couldn't figure out how the date of these lot samples, which are in Appendix C of the DOE report I referenced, were determined. There's no obvious date.

And so we didn't know if there was any back extrapolation going on. And it really

wasn't obvious to us. So that's why we asked NIOSH to clarify it for us. And they did. And I would like to thank them for that.

And essentially they pointed us to how to decode each of these data points based on what is termed a lot number, which are pretty complex. They're essentially a sequence of alphanumeric characters, 15 characters in total, separated by dashes. And it turns out the last three in that lot number represent the date.

And even that's a little confusing, because they started the whole process in January of 1962, which they designated as 001, essentially the first month that was considered for the study.

So then it follows that February 1962 is 002, and so on, up through the period of interest. So December of '72 ends up being around 132. So that was the date schematic on how you decode those.

So that information was provided in NIOSH's response earlier this week. And so once we got that, now we have the timeframe data. We

know it's not being back extrapolated.

So the other two questions, and I'll get back to the issue of being able to date these samples in a moment. But the other two questions we had was whether NIOSH was really just looking at a certain subgroup, and specifically Subgroup 6A in this pre-1973 period.

And the reason we questioned that is that it appeared in a 2011 NIOSH White Paper that they were considering Subgroup 6A to be the most representative group for that prior period. Based on the response I believe we're moving away from that 2011 NIOSH White Paper. So that's kind of been addressed.

And we also had questions about how you really come analytically to the conclusion that any sort of concentrating mechanisms, such as the mag fluoride process, how do we really know what duration they were?

And how do we sort of put a number on that out of historical information, the analytical basis, to convince ourselves that that sort of concentrating mechanism is not as

important, just because of the low concentrations we're starting with, and the default of ten parts per billion that was chosen?

And the response essentially boils down to the fact that as a, the qualitative look at the data prior to 1973, the numbers were so low, as I stated, 95 percent were essentially less than one part per billion. That all these other issues, such as the concentrated power of, these concentrated values in the duration of those activities is rendered moot.

So that's really the crux of this issue at this point, in my mind, is that, you know, maybe if these concentrations are so low prior to 1973, a lot of these other issues related to what individual workers could have been exposed to are covered and if the assigned default value is bounding.

So once we understood how to sort of convert the database values of RU constituents, that's, again, plutonium, neptunium, and technetium, we were able to extract the data from the recycled uranium electronic database.

It's an Excel file. And it's titled Fernald Recycled Uranium Raw Data Validated. You can find that in the usual Fernald location in the Advisory Board's document review.

So we pulled, based on that information we pulled out the 1961 to '72 data. And actually, the first sample, as I said before, is actually January 1962. The proposed defaults do apply to the earlier year.

And so what we did in the past couple of days, since we understood how to decode that data is we did our own scoping analysis to see if we sort of came out in the same place NIOSH did about these values being really low to the point that any concerns over concentrating mechanisms or duration of exposure to maybe a few higher concentration batches is averaged out and/or bounded.

And I'd like to throw a caveat. This is a very preliminary look at this data set. Again, this is only after the last few days. But it's to illustrate really where SC&A might still have a few concerns with the new defaults.

And I again caution, because of the timeframe, this has not undergone our usual QA, internal review steps, peer review, all of that sort of stuff to, well, to frankly make sure that I didn't make any mistakes.

So let me throw up a quick table there. Again, this is not an official document by any means. But it does sort of illustrate the scoping analysis that we did. So give me one moment here.

Okay. So does everybody see just a Word file with a table called Table 1 Overview of RU Data?

MR. HINNEFELD: Bob, this is Stu. I don't think I see anything.

MR. BARTON: Okay.

MR. KATZ: Black screen.

MR. BARTON: Black screen again. Okay. Let me try this again.

CHAIR CLAWSON: Yes. I got a question though. I thought we talked about this. I thought we'd already come to an agreement on this parts per billion. I thought that was taken back

years ago.

MR. HINNEFELD: Well, Brad, we discussed that. I mean, at the time of that discussion the, it was already the guidance to do dose reconstructions at 100 parts per billion throughout the entire timeframe of recycled uranium.

And so we were resolving an issue of, well, what about '73 and later or '76 and later, whatever. I think it's '73 and later, where stuff started coming in from Paducah that was higher in transuranics and essentially, in my words, crapped up the whole enriched stream.

So we said, well, if we're going to, you know, since we're digging back into this, let's take a more realistic shot at what they were at the various times. So I mean, it's part of the evolution of the discussion as far as I'm concerned.

CHAIR CLAWSON: Oh, okay. Well, I thought we'd already come to this, because --

MR. HINNEFELD: Well, it's one point we said --

CHAIR CLAWSON: I was actually having a hard time with the five parts because I was going more towards ten. So I thought we had come to this agreement. But we'll, you know, this will, we'll take a look at it and see what we've got.

Because I was, if I remember right I was seeing a lot higher than that. So I just wondered where we went from on it. So we'll keep going on. I'll get clarified, and we'll go from there.

MR. BARTON: This is Bob. Has the table appeared on Skype yet?

MR. KATZ: Yes.

MR. HINNEFELD: Yes. The table's there, yes.

MR. BARTON: Okay. I apologize again. This is only really thrown together in the last couple of days. But essentially what we did is we looked at a few basic metrics. And just for the sake of discussion I'd like to concentrate on plutonium.

Because, again, this is, it used to be

100 parts per billion. Now the proposed default is ten parts per billion. So it's kind of easier to keep in mind that way.

But as you can see, we looked at a few basic metrics. We fit the data to a log-normal. We looked at some simple things, like the arithmetic averages, median values, rank order, that sort of thing.

So if you look, the log-normal fit for plutonium, the GM is pretty low. It's less than one part per billion. But if we look a little lower here, you see how significantly high the geometric standard deviation is when you try to fit it to a log-normal, so high that when you go to calculate the 95th percentile, you're actually up over the 100 parts per billion.

And to us this was an indication of just how variable the observed plutonium concentrations were in this earlier period. And they went from lows of about, you know, ten to the minus four parts per billion, or .0004 parts per billion. There was even one negative number in there. All the way up to a maximum of 1,350

parts per billion. So there's a whole lot of variation in that.

So we looked at some other metrics here. And, I mean, you can see, if it's a simple average of the available data prior to 1973, it comes out to about 15 parts per billion. So, again, that's higher than the recommended default. And that's a simple average.

If you rank order all of these plutonium data points, and you look at the 95th percentile, you're up to around four times the proposed default, at 38.7 parts per billion.

And then finally, if you look at the last two rows in the table, and this is a simple count of how many are above ten parts per billion and how many are below ten parts per billion. And based on what we're looking at is a little over one-fifth or, you know, 20 percent were above that recommended default of ten parts per billion.

And also, what I have here is a simple rank ordering chart, I don't know if you can all see that. And, again, this is just a simple rank

order. This does not fit to anything. This is just the actual empirical values, rank ordered from zero up to one.

And as you can see, that rank ordered 95th percentile is up here, somewhere around in here, yes, around 38 parts per billion. And when you get to ten you're right around the 80th percentile, just like I just said.

So based on SC&A's preliminary analysis of these data prior to 1973, we're coming out in a very different place from where NIOSH was when they took a look at that data.

And, again, this is very preliminary. But once we understood how to translate, essentially, all of these recycled uranium constituent data points into the 1962 to 1972 period, and then after 1973, we're just not coming in, coming out at the same place that NIOSH has in their response.

MR. HINNEFELD: Okay, Bob, this is Stu. I have, of course, just seen this now. But my initial reaction is that the geometric standard deviation tells us that this isn't a

single distribution. This is multiple distributions because different kinds of materials are going to have different kinds of transuranic content.

We've even talked, you know, it's been part of our discussion is that certain things like mag fluoride, which is very poor in uranium, tends to have a higher TRU to U ratio than the material that went in to make the uranium, than the UF4 that went in to make the uranium.

So and associated with that is that I think by and large, certainly in the case of mag fluoride, there is very little uranium there. And so even though the ratio of plutonium to, or transuranic to uranium is high for that material, that's not very much transuranic.

And when you add it to the total of the uranium production for a year, or when you consider all uranium production, even all the residues that are processed, many of which were metal chips, what I'm, and it's -- this was the point of our argument, was not that mag fluoride was a short duration operation, but that the

amount of uranium was a very small contributor to the amount of uranium.

So even though that ratio is very high, that's not very much transuranic. And in fact, and again, any given person's exposure, they're exposed probably to many sources of uranium during the year.

And so the overall transuranic to uranium ratio is what's relevant for dose reconstruction. So that's the nature of what I see here, and not, you know -- I know you've done a lot of work since I sent that response out. I don't want to diminish this at all. It's well done. But I think we, the thing to consider here is what is the uranium content of the materials with the high ratios?

Because I suspect they're pretty low. I won't swear that for sure, and certain, maybe not in every case. But I would guess the bulk of them, the uranium content's pretty low.

MR. BARTON: And I understand that. I mean, they do, they're all certainly mitigating factors in this. But I guess where we came out

is the justification for ten parts per billion as given was that well, not even withstanding all the points you just made, all of our data, 95 percent is less than one part per billion.

And even the rest of it that's not, it's still less than ten parts per billion. And what I'm saying is, when we look at it, and we pull out the data from '62 to '72, that's really not what we're seeing at all. And so that's why we're bringing this up. Because if the justification was that, well, 95 percent of your data is below one parts per billion, that's not what we're seeing, again, in this, in our preliminary look at the data, again, prior to 1973.

MR. HINNEFELD: Okay. Well, I think that maybe some additional, you know, analysis of the information, both on your side and ours. The database you referenced where this data was drawn from is what, or the spreadsheet?

MR. BARTON: Yes, Stu, I'm not sure who compiled it. But it is your guys' spreadsheet. And I did check to see that it

comported with the values that, the hard copy values that are in the DOE 2000 report.

And you can find that, again, AB document review in the Fernald folder. I can give you the title of that Excel sheet again. Let me see here. I have it written down. I thought I had it written down.

Well, I mean, you'll see it. It says recycled uranium raw data validated, essentially. And there's the validated tab in there. And, again, I checked it against the original. So I'm fairly confident that that is the electronic representation. I believe that if you didn't necessarily put it together, maybe you got it from the folks who put that DOE report together.

But I agree. I don't think we can go essentially off this, you know, 10,000 foot view of things. But at the same time, the rationale that everything is much less than one parts per billion, you know, we didn't see that.

MR. HINNEFELD: Okay.

MR. BARTON: So I agree, I think maybe, I mean, certainly from my point of view

I'd want to really clean up what you're seeing here, provide more detail than what I'm looking at, some analytics on it, and obviously discussion of some of the higher observed samples and how they actually fit in to what we're trying to do here would be beneficial to formally document from our side. And I'm sure on your side as well, you'd want to take a look at that same data set.

Because I got the impression, just from the use of the words qualitative. I believe qualitative was the term chosen in the most recent response in a quick view of the data in the October 2017 response. I'm sure you'd want to take a little closer look at that. But obviously that, any of that is at the discretion of the Work Group.

MR. HINNEFELD: Okay. Hey, Bob, the, you, that database apparently includes enough of the lot code to include the last three digits, so you could date them. Is that correct?

MR. BARTON: Yes, that is correct.

MR. HINNEFELD: Does it include the

entire lot code?

MR. BARTON: Yes.

MR. HINNEFELD: Okay. Well then, there will be a material type code in that lot code. So we'll be able to determine what the materials are for each of these samples.

MR. BARTON: Yes, that's my impression. I think you might even be able to put them in a specific facility even. I'm not entirely sure --

MR. HINNEFELD: Yes, the facility I believe was where it was generated.

MR. BARTON: Oh, okay.

MR. HINNEFELD: If there's a facility, well, if it came from off-site there's a designation. And there are a few designations that designate off-site locations. And then there's a -- if it was generated in the plant there's a designation for what was generated in the plant.

MR. BARTON: Yes. I mean, the database is very extensive. And there are even a lot of comment fields that I didn't quite

understand, which that was what led me to believe that you folks had put it together.

So I think there's a lot of information there. What information wasn't there when we first looked at it was a specific date, at least not prior to 1973. But once we knew how to decode that lot number with the final three digits, then we were able to actually pull out that pre-1973 data. And that's what we're looking at here. At least for the scoping calculation.

MR. HINNEFELD: Right.

CHAIR CLAWSON: Well, it sounds like we've got some work to do then, re-evaluate this, and go from there. So this is going to be a response from SC&A to NIOSH. Is that correct? Or did you need more information, Bob?

MR. HINNEFELD: Well, I don't know. Bob, how do you want to do this? Do you want to do, you know, give this, what you've done so far, your normal polish over then, and provide it? And then we'll work up? I mean, we can get that database out now and start looking at it from our

side. And then have us prepare a response to that? If you want it.

MR. BARTON: I think that would be a good way to go, almost to work it. Not recreating work.

MR. HINNEFELD: I mean, you can send us what you want. I mean, if you want to send us this, I mean, we can work from that, and respond to that. Or if you want to wait and polish it some and send it over, then we can work from that.

CHAIR CLAWSON: I'd rather have it polished and put together and make sure that we're all on the same page.

MR. HINNEFELD: Okay.

CHAIR CLAWSON: So, that's up, that's in your court then, Bob. So --

MEMBER ZIEMER: So you're going to send that out to the Work Group as well?

MR. BARTON: Yes, absolutely. This would be a formal memo, or whatnot, from SC&A to the Work Group and NIOSH.

MEMBER ZIEMER: And then we'll get Stu's response maybe more formalized than we had

just now?

MR. HINNEFELD: Yes, we'll get --

MEMBER ZIEMER: All depending on --

MR. HINNEFELD: We'll put together what we learned from looking at this.

MEMBER ZIEMER: Yes. Because that was just your initial reaction, having not seen any of this before, right?

MR. HINNEFELD: Right. Yes. I'm embarrassed to admit I'm not familiar with the database. And so I'm, so I don't know for sure. I was just speculating about whether those were really low uranium materials or not.

CHAIR CLAWSON: Well, we need to make sure on this. So we'll leave that up to you, Bob. And put that through there. I thought we had this a little bit more put together. But, okay, let's go on to the next slide. Are you done with this one?

Thorium Coworker Model

MR. BARTON: Unless anyone has any other questions, we can move on to thorium and the chosen DAC value. All right. Not hearing

any questions.

Now, this one, this is actually, we didn't have any clarifying questions on it. I think you're going to find that this is a pretty easy one, luckily.

So really the issue is, we're talking about the period from 1990 to 1994. And this is how you're going to assign thorium doses during that period. And more importantly, thorium doses to workers who do not have in vivo monitoring, which would allow for thorium dose reconstruction in that method.

So essentially what we're talking about is occupational unmonitored dose. And the plan is to use ten percent of the derived air concentration and apply that to unmonitored workers.

And more specifically, using Class W, which stands for weeks, also known as Solubility Type M, derived air concentration which is five times ten to the minus 13 microcurie per milliliter. So ten percent of that is obviously five times ten to the minus 14.

And, again, this goes to workers who were not monitored by the IVEC system, which is the in vivo monitoring system that was in use at the time.

And so we were looking at that originally. And we questioned whether the site really always used that Type M or Class W solubility type when they were setting up their air sampling program.

It would certainly be more appropriate, and the reason we questioned that is because if you look at a Type S solubility, or Class Y, it's actually a little bit higher value, by a factor of two.

So obviously if you have a higher DAC value and you're assigning a percentage of that DAC value to the claimant, if you use the higher DAC value you're going to have a little bit higher dose.

So we said, you know, the assumption is Type M. Do we have anything to justify that as being more appropriate than Type S? Because Type S would certainly be more appropriate if

there were certain areas of the site that used that higher DAC to control airborne concentrations.

Or alternately, if no information was available as to what DAC was used, then you could say it's favorable to the claimant to use the higher DAC value to assign dose.

So we had originally asked if there are any references to sort of back up the assertion that the site strictly used that Type M derived air concentration value and that it's actually more scientifically appropriate to use that value.

And so essentially we're asking for a little backup. And that's the common theme during today's meeting. And in the October 2017 matrix response NIOSH provided an SRDB reference. That's Reference 4152, titled Radiological Air Sampling Program and Air Sampling Philosophy.

This particular document is beneficial because it's dated from early 1989. And that's the period right before the period we're talking about, 1990 to 1994. So it's really

just before the period of interest.

So it doesn't have any significant temporal concerns, say if you were trying to extrapolate air sampling policies from the '50s and '60's to the '90s, you know, one could question that certainly. But this document is literally right from before the period of interest that we have.

And so Section 5 of the report that NIOSH provided, and, again, it's a reference. This is not something written by NIOSH. Section 5 is titled Elemental Isotopic and Chemical Forms of Radionuclides Found in MPC Plants.

And basically it goes by site location. And it says what, you know, the chemical forms of any uranium or thorium that's there. And what should be assumed for the air sampling program. I mean, this is exactly what we were looking for.

So Section A of that section has the pilot plant. It talks about the residual thorium embedded in the floor and inside old processing tanks.

And it states that while the pilot plant's not processing anything, and this was in 1989, but any demolition, D&D activities, or just dust-generating activities should be controlled to the Class W, which is the proposed DAC to be used in the NIOSH methodology.

Further down in that same Section 5 you have Building 64, which was a repackaging location for the Building 65 thorium, which we'll talk about a little bit later when we get into thoron. And, again, it's Class W. It says right in there it should be controlled to Class W.

And then Section K talks about Building 65, 67, and 68. And it notes that no thorium is presently handled, but if handling occurs the Class W thorium limit applies.

So beyond that reference we didn't find any evidence that the Class Y DAC was being assumed by the site anywhere during the period of interest.

And I'd also like to note that it's actually, again, we're talking about the unmonitored portion of the workforce. Back when

we reviewed the original thorium methodology White Paper we did a study of claimants.

And we found that, we looked at roughly 250 different claimants and found that almost three-quarters of them were monitored in vivo during that period. So this wouldn't even apply to them. And the remaining claims that were not, didn't have in vivo records we looked at in a little bit more detail.

And we had an observation from that review, and it basically said, it is highly unlikely that unmonitored workers would have been continually exposed to airborne thorium levels above ten percent over DAC for the entire duration of their employment and during the period of interest.

So given all that, we have site documentation that says Class W was to be used in the air sampling program and the fact that we're talking about sort of a small portion of the potentially exposed workforce, because really thorium doses would be reconstructed using in vivo records if the claimants had them.

So for that one-quarter of the population that didn't have in vivo during this period, we feel like the ten percent Class W DAC is appropriate. And, you know, unless the Work Group has any outstanding questions or comments, we simply recommend that this issue be closed.

CHAIR CLAWSON: Do any of the Board Members have any questions on this?

MEMBER ZIEMER: This is Ziemer. I agree with that recommendation based on what was just covered here.

CHAIR CLAWSON: Okay. Then we'll close that issue. Back to you, Bob.

MR. BARTON: Okay. I just realized I hadn't put anything up on Skype. So the next issue is going to be the parameter selection for thoron. So let me just throw up the NIOSH response here again. We'll get rolling on that one.

Okay. So you should all see, again, it's a Word file with SC&A's clarifying questions under thoron. And then a response that is provided in red. So as soon as that's up I will

get started.

MR. KATZ: It's up.

MR. BARTON: All right. Great. Okay. So, again, this is discussion of the parameters for thoron exposure model. And this was part of their thorium dose reconstruction methods. That methodology is now part of the TBD. It's contained in an appendix. It used to be a --

(Telephonic interference)

MR. BARTON: And this issue stemmed from a finding that we didn't feel there was necessarily a firm technical basis for them to support some of these various parameters chosen to model thoron exposures.

Not that we necessarily thought they were wrong parameters. But anytime you are trying to model something without really having direct measurements necessarily that can be used, you know, you try to tailor your parameters to the specifics of the situation. And then, in cases of ambiguity you maybe err on the side of caution.

Anyway, this was discussed last during

the July 2017 meeting. And NIOSH essentially came out of that with three, I guess you call them action items.

One is to take a look specifically at Building 65, that is, you know, model, try to model Building 65 specifically, rather than a more site-wide type model. Because there's reason to believe that that specific location was likely the bad actor as far as thorium exposures, and by extension thoron exposures.

So that was one thing. The other was to discuss the release fraction, which, or emanation fraction I think it's often referred to, which is basically, you know, you have this mass of thorium in a barrel. How much thoron is actually escaping into the breathable air for exposure?

And then the third thing that NIOSH was to look into was to sort of justify the chosen occupancy time. At the time it was generally three months out of the year to be in these buildings, exposed to thoron. Or at that time, I believe it was after 1990, that went from three

months down to one month.

So in the October 2017 matrix update, as a result of those July discussions we gained lots more information, including a model of Building 65, which we just discussed. And also example calculations and a discussion of the various parameters, including the release fraction and the occupancy time.

And so based on that response, we really had three, again, three clarifying questions. The first had to do with this release fraction.

And now the release fraction generally ranges from ten to the minus three to ten to the minus four. The suggested model took the lower end of that range. And so we originally questioned that because if you have a range of values and you're not quite sure, I mean, should you really be taking the lower end? And I really don't want to belabor this particular assumption because these, again, these selections are reasonable.

And in the response NIOSH basically

pointed out that if you use that lower end, the ten to the minus four release fraction, among the other selected assumptions, such as the amount of thorium that would be present, the available air space for it to emanate into, all those things, you actually end up with an air concentration that is very similar to a measured. So that's an empirical air concentration in Building 65.

And I'll kind of scroll down here so you can see where that -- that's this top formula here, as you can see, right here is your release fraction, the one times ten to the minus four.

And you follow that through, and you end up with 300 picocurie per liter in one of the higher measurements that was seen in Building 65. And, again, it was limited data. But one of the higher measurements I believe was 267 picocurie per liter.

So when you use that chosen release fraction, even if it's sort of on the lower end of the spectrum, you end up right around the range of what we have in some limited empirical measurements.

And I'd also point out that if you look at this formula, which I hope all, those of you on Skype can see. If you start to use the high, if you use the higher end release fraction, well, now your estimate of air concentration is 3,000 picocurie per liter instead of 300.

And, again, that's compared to our empirical measurement, which was 267. So, you know, a factor of ten on top of that. Or even if you sort of split the baby and use the midway point, you'd end up, you know, around 1,500 picocurie per liter, which is a pretty high estimate.

And I don't think we really have any evidence or empirical measurements among the data we do have to indicate that it ever, ever really got that high. So essentially our issue was that the selection of the release fraction wasn't all that justified.

But I think in NIOSH's analysis where they compared an empirical measurement found in Building 65 to a model of what Building 65 could have been, and you end up in the same general

area as far as air concentration, to me that's a pretty good piece of evidence.

And so we really don't have, SC&A doesn't really have an issue with the chosen release fraction in that it's a reasonable assumption, which we said at the outset. And it does comport with the limited empirical data that we do have.

So that was the first parameter that we really wanted to discuss today. I don't know if there are any questions on that particular one. Or we can move on to the occupancy factor, if the Board would like.

CHAIR CLAWSON: I didn't have any questions. This is Brad.

MEMBER ZIEMER: No. I'm okay with that. Sounds good.

MR. BARTON: Okay, great. All right. So --

MEMBER SCHOFIELD: I don't have any questions.

MR. BARTON: Oh, sorry, Phil. Great. Did I forget anybody? Okay. Okay, great. Well,

moving on to the occupancy factor. And I'll scroll back up here to where that is sort of dealt with.

So this was SC&A Clarifying Question 6. Occupancy factor is, again, it's basically a measure of how long would someone have been exposed to these thoron concentrations inside these buildings, which are essentially storage buildings. And NIOSH selected 25 percent of the year, or three months.

Also part of our question was, well, you said three months for this time period, and then one month later. So based on NIOSH's response it appears that three months is going to be the default for the entire period.

And that the one month which had appeared in an earlier version is no longer on the table. And I think that was from 1990 to 2006.

So if I'm not misinterpreting that, and, NIOSH, please stop me if I am, that answered part of our question as to whether it was assumed to be three months or one month. It appears to

us that the assumption is going to be three months across the board. If that is correct, I will keep rambling.

MR. KATZ: Keep rambling, Bob.

MR. BARTON: All right. I will do.

CHAIR CLAWSON: What, is NIOSH in agreement with this? Or are we --

MR. HINNEFELD: I'm trying to reconstruct our thought process on this. I don't know if Mutty can help out on this or not.

MR. BARTON: Well, if you read from the response it says, at the end of the NIOSH response it says, the one month of exposure per year from 1990 to 2006 assumption does not apply to the three month value in NIOSH 2017B, excuse me, is more conservative.

So I read that to say the one month is not on the table anymore and that the three month value that was in the issues matrix from October is what we're talking about.

MR. HINNEFELD: I believe that is, I believe that's right.

MR. BARTON: Okay. The other part of

the question is about --

MEMBER ZIEMER: Well, let me interrupt a minute. Just a clarifying point. This is Ziemer. Is the occupancy factor based on a 40 hour work week in this case? Or were we using a different figure for Fernald? I just couldn't remember.

MR. HINNEFELD: It's essentially 25 percent of the year, or 25 percent of any given week, because these were storage locations.

MEMBER ZIEMER: Oh, okay. Yes. Got you. Okay. So that's a continuous then?

MR. HINNEFELD: Yes. We felt like that would be a bounding estimate how long --

MEMBER ZIEMER: Right.

MR. HINNEFELD: -- anyone might be in a storage facility that was used strictly for storage.

MEMBER ZIEMER: Got it. Thanks.

MR. BARTON: And that was generally the other part of our clarifying question. Essentially, do we have anything to hang our hat on, on that 25 percent, that would indicate it's

an accurate estimate.

And I agree, we here at SC&A, it certainly seems reasonable for a storage facility. And it's not just my opinion over here. We had Milton Gorden who's on the phone look at this, and also Joyce, who had the original finding about these thoron parameters. And they all pretty much agreed the 25 percent is fine, especially if we're forced to make, you know, sort of an educated guess.

So I guess absent other information, like if there's no documentation that we can find that suggested a particular rotation of workers to storage facilities, or any evidence of a permanent storage facility position, or something like a, you know, like a daily weighted exposure, which will often give you information such as, you know, spent three hours a day in the storage facility.

Absent any information such as that, and absent any indication that would couldn't maybe fine tune that estimate, then SC&A is fine with going with this three months per year for

the entire period in which we're assigning thoron.

MR. HINNEFELD: Yes. Bob, I'm certainly not aware of any document that might exist that would have recorded that. Certainly the daily weighted exposure averages were done, those all stopped about 1970. So for later years they certainly wouldn't be available.

And recall, these are not storage locations where people go and get materials from to process periodically and take them to the process area. These, the thorium just sat there, you know, from roughly 1980 through the time they remediated the buildings.

There was almost no call for thorium, except once in a while they'd go retrieve some of the better stuff and ship it to, you know, in small quantities to a customer. And then people may go in for inspection of drums and things like that.

But it wasn't like this was stored process material that people were going and getting and periodically using. It was just

sitting there. And, you know, dormant. So I thought that, you know, we thought the 25 percent certainly, just intuitively seemed pretty bounding.

MR. BARTON: Yes. And over here at SC&A we agree with that. Again, this is sort of a due diligence question to see if maybe there was some sort of documentation that would put a harder number behind it.

But absent the existence of that sort of information, then we find the three months out of a year to be perfectly reasonable. Is there any questions on the occupancy factor?

CHAIR CLAWSON: No. That sounds good to me.

MR. BARTON: All right. Our final question on this thoron issue was, we were a little confused about what the actual intended thoron assignment was going to end up being. Because we saw a couple of different estimates of it.

There was the original White Paper, which morphed into an appendix in the TBD. And

we have the October estimate, and now we have this most recent one. And it looks like really the methodology put here looks like it's going to be the, sort of the final say.

And I'm going to scroll down to this equation. Because the other part of this question was, we thought we had found an error. And we had our suspicions on where the discrepancies were.

Because when we were sort of plugging all these parameters in, we were coming out at a different spot than NIOSH was. And once we saw this response on Monday it's, I, we think it's pretty clear where the discrepancy's coming out on.

And if you can see, it's the second formula here. But it's this term here, the .25. And that's the occupancy factor, .25. And really what it should be, since you have a given working level, which I believe it's 1.6 working levels.

To get from working levels to working level months, you simply apply the working level by the number of months. In this case what it's

actually multiplying by is, it's saying instead of three months per year, it's essentially saying the occupancy is a quarter of a month per year.

And, again, it's that third term in this equation. So that shouldn't be point -- even though it's a quarter of a year, that term there should be .25, or it should be three months out of the year, and not .25.

And I think where that confusion stemmed from is that occupancy factor kind of means a little bit different thing when you're talking about radon and thoron working levels, than it does in other sort of health physics problems.

For example, if you had an annual dose estimate for someone, say it's 1 rem, and they only were in that area for three months, well then, yes, you would take that annual dose estimate and multiply it by .25 to get what the exposure would have been during that three month period.

But here what we have, I think of more akin to being an exposure rate, not as a total

exposure. So once we have a working level, which is essentially alpha energy in the air, to get from working levels to the final result, which is working level months, you multiply it by the number of months.

So, again, it appears that this estimate is off by about a factor of 12. Well, not about a factor of 12, exactly a factor of 12.

MR. HINNEFELD: Yes. I agree with Bob's discussion there. So --

MR. BARTON: So, I mean, we discussed, you know, the occupancy factor and the emanation fraction. And, really, the other parameters seemed reasonable to us.

So if that error, just in converting working levels to working level months gets fixed, SC&A really doesn't have any other issues related to thoron.

CHAIR CLAWSON: But I just want to make clear here, we are, we are discussing that we're taking that 2.5 out, and the factor is becoming three months, correct?

MR. HINNEFELD: Yes. It's a 0.25.

It's a 0.25. And that becomes a three.

MEMBER ZIEMER: Yes. All right. That's pretty straightforward. That correction needs to be made.

MR. BARTON: Okay. And that's really all the discussion I had for thorium or thoron on this.

MR. KATZ: So the Work Group can close that, right, Brad, and Paul, and Phil?

CHAIR CLAWSON: Yes. When that gets changed to three, then --

MR. KATZ: You can close it now. You don't need to, that will get changed.

CHAIR CLAWSON: Okay.

MR. BARTON: So I guess the proper term would be in abeyance until that --

MR. HINNEFELD: Yes. Actually I guess we got to write something that actually has the correct number.

MR. KATZ: Right. That's all. But, yes.

CHAIR CLAWSON: Okay. I have no problems with that.

Uranium and Radium Poor Raffinate Material

MR. BARTON: All right. Well, that concludes the thorium discussion. So now I guess we would be circling back to uranium and radium poor raffinates. I can give a brief background on it, if it's helpful to the Work Group. Or, Stu, I don't know if you want to give an update. Or both.

MR. HINNEFELD: Well, why don't you give your issue in your words, Bob? And then I'll tell you what I've been struggling with all week.

MR. BARTON: Okay. I don't have, we don't really have anything to put up on Skype for this particular issue because it was still being worked on. But I guess what we're really talking about here, again, it's raffinate material.

And it's specifically raffinate material that is poor in uranium and radium. In other words, those things have been sort of stripped out.

Now the TBD currently covers three exposure scenarios for raffinates, such as the K-

65 drum operations, which run from '52 to '56, processing pitchblende ores, '54 to '58, and handling yellowcake material up until about 1961.

So those three scenarios, to reconstruct those doses you've either a radon breath analysis. Essentially we have radon breath measurements, which you can use to calculate essentially a radium intake. And then use that to back calculate to the other constituents in the raffinate. So that's one way. And that is used for one of the scenarios.

And then the other is we have lots of uranium urinalysis at Fernald, I mean, over 400,000 data points. So what you do is you simply take a uranium urinalysis result, and you use some assumed raffinate contamination ratios. And then you are able to add in those intakes to the contaminates and the raffinate that weren't monitored.

The problem is, or potential issue is, at the back end of two, three, you might have raffinate material that had that uranium and radium material stripped out.

So now if you use a ratio to uranium, well, the uranium's not there. And you're going to get pretty unrealistically high intakes of the other raffinate constituents. And really, the main concern here is thorium-230.

And if there's no radium, or little radium, obviously there's no radon either. So you can't really use any sort of breath measurements.

This was really first discussed in December of 2014. And at that meeting one potential avenue for assigning doses to this material was, it was discussed, or I guess a more accurate term would be spitballed.

I think it was more in the guise of, well, this could potentially be one possibility to assign dose. But NIOSH wanted to take a closer look at the data they had, et cetera.

So during the July meeting this past year, NIOSH stated that they don't believe any exposure potential existed. But essentially, even if it did exist, that those exposures would really not be reconstructable.

And since what we're talking about falls into the current SEC period, it could essentially be swept up in the thorium-232 SEC.

So at that time SC&A's position was basically, okay, well, we have our answer. Or I guess really two potential answers. But the evidence supporting those answers hadn't been, really been documented.

So it's sort of like, you know, back at school. Even if you know the right answer you have to show your work kind of thing, or you get docked.

So in the matrix update NIOSH reiterated that position that there was either little to no dose, or if it was, it was not reconstructable. But, again, the case really had not been fleshed out yet. And so that's essentially where we're at currently.

MR. HINNEFELD: Yes. Thanks, Bob. And to deal with, to look at this, I tried to look at, well, what do we know about air monitoring that was done? Because as Bob pointed out in his clarifying question about Number 1,

his Clarifying Question Number 1, he cited some SRDB references. Well, look, you've got air samples corrected at the hot raffinate building and the combined raffinate building and, in some cases, daily weighted exposures calculated for various people who worked there, et cetera.

So well what about that? Is that a method that can be used? And so I've spent the week relearning, if I ever knew, some of the history of the refinery and also kind of crudely compiling the air sampling data that is collected from the raffinate locations.

There were two areas called raffinate where you can find air sampling from. One was called hot raffinate. And the other was called combined raffinate.

Now I've seen several, I've seen references in some of the Fernald documentation about something called a cold raffinate system. But I don't think I've seen any air samples that specifically said cold raffinate. You know, I think, I'm not even sure exactly what would have gone, and what would be considered cold

raffinate.

But the combined raffinate I believe would be where the output of the hot raffinate system, meaning the material where the radium has been filtered out, whatever liquid is left, where that was sent to combined raffinate. And so probably what you would have in combined raffinate would be material without radium, and probably without uranium as well.

So I think, as I looked through this, it seemed to me like the hot raffinate air samples probably aren't particularly relevant because, at least during ore processing, which would be from 1954 through 1958, there would be radium in the hot raffinate.

And so you really couldn't draw a conclusion that those air samples are going to be informative of what the thorium-232 is, which is what we're interested in here. We have another method for doing radium.

And so looking at the combined raffinate air samples during the ore period, '54 through '58, you do in fact see concentrations

that are typically around, oh, somewhere around 0.2 times what was called the maximum allowable concentration, which was 70 dpm per cubic meter.

So you're talking about airborne concentrations on the order of 15, you know, ten to 20 or ten to 30, for the most part, dpm per cubic meter, kind of centering around 15, just looking at it, eyeballing it.

But once the uranium, once the ores stopped running in 1958, and in '59 as I understand it they switched to ore concentrates, which would have been pre-processed at the mill, then they are in the cold raffinate or the combined raffinate area. The air sampling results are all uniformly 0.1 times the maximum acceptable, times the max, maximum allowable concentration.

And which is, by the way, there, I never saw a number reported as zero. Zero point one was the lowest number I saw reported.

Now interesting and related to that, you know, so you've got this 0.1 MAC result from combined raffinate when they were running ore

concentrate. Also, there are some similar air studies done from '65 through '67 in a combined raffinate area. Excuse me.

And those are, during that period according to some documents that we have about the history of Fernald operations, and I think a site expert interview, one of those two documents says that when the refinery restarted in 1966, and that would be fiscal 1966, it ran only residues, which means materials that are reclaimed from elsewhere in the process.

So the refinery started in '54. It ran ore for '54 through '58. Apparently from '59 to '62 it ran ore concentrates. And then it shut down in fiscal, at the end of fiscal 1962. So, July 1st, 1962 the refinery shut down. And all the refining work was moved to Weldon Spring.

Well, Weldon Spring closed in, roughly 1966. So they reopened the refinery at Fernald in 1966. And there is in fact a break in the air monitoring data, at least that we have. We don't have -- we have data for '62. We don't have any for '63 or '64.

We have data for '65. And these data are reported on a calendar year basis. So that's probably the last half of '65, which would be fiscal '66 and then data in '67 and '68. And in the combined raffinate those samples are also 0.1, the same as they were when the plant was running for concentrates.

Now for the, when the refinery is running residues, this is, you know, reclaiming uranium from products within the plant, there should not be any thorium-230 there. You know, that uranium was purified in order to get to the rest of the plant.

There's not enough time for any thorium-230 to grow in. So there wouldn't have been any thorium-230 in the material going through combined raffinate in the '60s, and '66 and '67, et cetera. But still, you get the same airborne sample result that you get when you're running ore concentrates.

So that makes me wonder whether in fact we even know what we're seeing on those filters and can we really draw the conclusion

it's thorium-230 for the years 1959 through 1962.

Then we go back to the four years where theoretically there might be some thorium-230 there. And it occurs to me that I think we want to do a comparison to what intake would we develop from this air data we have from '54 through '57 for combined raffinate and how would that be compared to the addition that we're going to have to the uranium doses because we're considering uranium results to be related to feeding pitchblende ores.

So, in other words, it could very well be that a dose reconstruction using the assumption that the person was feeding pitchblende ores would give them a larger intake than the thorium-230 airborne samples. See what I'm saying? We still have to work that out.

So we're going to have to meet, we need to provide some more information about this, and do our actual thought process, and build this out. But that's kind of where I'm starting from. So does anybody, can you kind of follow along the logic there?

MR. BARTON: This is Bob. Absolutely. I think this is exactly the type of looking deeper into it. And I would really, really feel comfortable if the argument was, well, listen, even if we apply a methodology to these low, low 0.1 MAC samples it would never, essentially never be used because it's always going to be bounded by another method that's in place.

So I think that is worth pursuing and, you know, fully getting your head around it, and formally writing it up. And then we'll have something concrete to either move forward or close it out. That's at least my thoughts on it.

MEMBER ZIEMER: Well, it makes sense to clarify that issue. That's a very interesting information, I think needs, take a look at that.

MR. HINNEFELD: I really enjoyed the --

CHAIR CLAWSON: That's fine with me.

MR. HINNEFELD: Yes. I really enjoyed the walk down, it's not really memory lane. I don't remember 1962, at least not, I don't remember Fernald in 1962. But it was kind of

interesting to read about it, for sure.

CHAIR CLAWSON: Well --

MR. BARTON: So I guess the path forward would be, that would be in NIOSH's court, with you and your team, Stu. And --

MR. HINNEFELD: Right.

MR. KATZ: Right.

MR. BARTON: Okay. So I guess to sum up, for uranium radium poor raffinates we'll be seeing something formally written up from NIOSH. For recycled uranium both NIOSH and SC&A have action items to pursue on that issue.

And with regard to thorium the two issues were the chosen DAC solubility and thoron parameter selection, which I believe we closed both of those out.

CHAIR CLAWSON: Okay. Is there anything else we need to discuss?

WG Recommendations and/or Path Forward

MR. KATZ: Sure. Yes. Thanks, Brad. So there's very little left.

MEMBER ZIEMER: Yes.

MR. KATZ: Oh, go ahead. Paul first.

MEMBER ZIEMER: Oh. I was trying to remember for, do we have Fernald on the agenda for April? Or are we going to get a status report?

MR. KATZ: That's what I was about to address. So we do have Fernald on the agenda, but it doesn't need to stay there. And although there's very little left to wrap up the Site Profile review, it seems like we might as well button it up first, right. And there's no, it doesn't make much sense to give an update when there's so little left to finish, right.

CHAIR CLAWSON: That's correct.

MR. KATZ: So I would suggest, Brad, and Paul, and Phil, that we just take that off the agenda for the April Board Meeting. We can have some, we can report out from site pro -- some procedure reviews, instead of Fernald. And then expect to have Fernald on the agenda for the August meeting, if that makes sense to all of you.

CHAIR CLAWSON: Well, that's fine with me.

MEMBER ZIEMER: Yes. That makes sense to me, yes.

MR. HINNEFELD: So, Ted, this is --

MEMBER SCHOFIELD: It does to me.

MR. HINNEFELD: What you're saying then, Ted, is there won't be a presentation with PowerPoints and stuff like that. But when we go around the list of activities by the various Work Groups, Brad could say, well, we met --

MR. KATZ: Oh, yes. Of course.

MR. HINNEFELD: Yes, okay.

MR. KATZ: Absolutely. I mean, Brad can report out just in the very summary way that he does about where the Work Group is and that this will be coming up for everybody in August.

And then once we do wrap up these last couple items, we can produce, or SC&A can produce a cleaned-up final matrix for the Site Profile review that covers it comprehensively. And that could be presented, and that would be, then we'll be done with Fernald, for the Site Profile review.

MR. BARTON: This is Bob. One

question I had was, we've been kind of operating off sort of the old method of these paper matrices. And I know we really want to be migrating all these things to the BRS.

Is that something that should be SC&A's purview? Is that in NIOSH's court? Or do we want to hold off until everything's done and then we can --

MR. KATZ: Well, I think so, I think, Brad, I mean, given how far down the road we are now, I think what makes sense is just when you produce your final matrix that will be dropped into the BRS without -- there's no point at this point having back and forth, and not filling out the BRS really. But that can be dropped in the BRS just so that the BRS is complete. But I don't think there's anything to do with the BRS until we have that final matrix with everything complete. Does that make sense?

MEMBER ZIEMER: Yes.

MR. BARTON: Oh, it certainly makes sense to me.

MR. KATZ: Yes. Okay, good. All right

then. Brad, anything else for the good of the order?

CHAIR CLAWSON: No. I don't see anything at this time. So what, are we kind of looking at a timeframe for that?

(Simultaneous speaking.)

MR. KATZ: Go ahead, Stu.

MR. HINNEFELD: I was going to hem and haw. I guess I'll hem and haw first. But I think I'll say the same thing I always say on those questions, Brad, is that we have to fit it in to everything else the project is doing as well. And we'll have to consult with, the contractor will have to evaluate its resources and how they're being utilized. And so --

CHAIR CLAWSON: Well, I guess --

MR. HINNEFELD: It looks like something could easily resolve before August. But in terms of picking a date, I think I'm a little hard-pressed to pick a date.

CHAIR CLAWSON: Well, I just want to make sure that we have time to be able to review this and get to it. I understand the resources

are there. But it sure would be nice to be able to bring this one to closure.

So whatever we can do I would appreciate it. But I'd also like some time to be able to have SC&A review everything that comes in. Maybe it can even, if we need a technical call, or whatever like that. But I would like to wrap it up when we can.

MR. BARTON: Yes.

MR. HINNEFELD: Yes, absolutely. Absolutely.

MR. BARTON: Yes.

MR. KATZ: Well, when, Stu, when you have an estimate if you could just pop an email over. And --

MR. HINNEFELD: Yes, I will.

MR. KATZ: I'm assuming, Bob, your follow-up from this is not, won't take that long because you've done most of the work that you really need to do.

MR. BARTON: Yes, I would imagine it can be wrapped up fairly quickly. I don't think we'll looking as in depth at it as Stu's team

will be with the materials and whatnot. But, yes, I think --

MR. KATZ: Right.

MR. BARTON: -- be a little bit quicker over on our side.

MR. KATZ: Okay.

MR. HINNEFELD: Yes, Brad, I think we both recognize that we want to get our, we each have a product to develop. We want to get it out to the Work Group and to, we want to get it to SC&A.

They want to get theirs to us well in advance so that we can digest what each other is saying and come knowledgeably to a Board Meeting. Well, you know, and get that out of the way well before the, or to a Work Group Meeting, get that out of the way before the August Board Meeting. We recognize all that.

Adjourn

CHAIR CLAWSON: Okay. And I appreciate that. So with that being said, I think that unless there's anything else pressing that needs to come before the Board, I think we're

adjourned.

MR. KATZ: Thanks, all of you.

(Whereupon, the above-entitled matter went off the record at 2:13 p.m.)