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UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

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PUBLIC MEETING TO DISCUSS

OVERVIEW OF NRC MONITORING

ACTIVITIES OF THE SALTSTONE

DISPOSAL FACILITY

+ + + + +

Monday, August 6, 2012

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DOE Meeting Room/DOE Center

230 Village Green Blvd

Suite 220

Aiken, South Carolina

+ + + + +

The above-entitled hearing was conducted at 1:00 p.m.

BEFORE: NISHKA DEVASER, Facilitator

ATTENDEES:

George Alexander

Nancye L. Bethurem

Thomas Frank England

Harry Felsher

Victor Franklin

Kim Hauer

Brenda Hays

Justin Koon

Barry Lester

Lisa London

Karen Patterson

Karen Pinkston

Christianne Ridge

Kent Rosenberger

Sherri Ross

Mark Schmitz

Roger Seitz

Richard Sheppard

Scott L. Simons

Malcolm Smith

Gregory Suber

Linda Suttora

Steven Thomas

Shelly Wilson

A G E N D A

P R O C E E D I N G S

MR. DEVASER: I'm Nishka Devaser. I'm the meeting organizer here. I work for the NRC. The title of the meeting today is the Overview of NRC Monitoring Activities of the Saltstone Disposal Facility.

Before we get started, let's have a round of introductions, who all's called in on the line.

Anybody?

(No response.)

MR. DEVASER: I guess not. All right. We'll start down here with Kent.

MR. ROSENBERGER: Kent Rosenberger with the Savannah River Remediation.

MR. SMITH: Malcolm Smith, Savannah River Remediation.

MS. ROSS: Sherri Ross, DOE Savannah River.

MS. SUTTORA: Linda Suttora, DOE Headquarters.

MR. DEVASER: Nishka Devaser, NRC, Global Waste Branch.

MR. SUBER: Gregory Suber, Chief, Low Level Waste Branch, NRC.

MS. PINKSTON: Karen Pinkston, NRC, Performance Assessment Branch.

DR. RIDGE: Christianne Ridge, NRC,

Performance Assessment.

MR. ALEXANDER: George Alexander, NRC, Performance Assessment.

MR. FELSHER: Harry Felsher, NRC, Global Waste Branch.

MR. HAUER: Kim Hauer, Savannah River Remediation.

MR. THOMAS: Steve Thomas, Savannah River Remediation.

MR. ENGLAND: Savannah River Remediation.

MR. SHEPPARD: Richard Sheppard, SRR.

MR. LESTER: Barry Lester, Savannah River Remediation.

MR. KOON: Justin Koon, SCDHEC, Solid Waste Programing Section.

MR. FRANKLIN: Victor Franklin, SRR.

MS. PATTERSON: Karen Patterson, South Carolina Government Nuclear Advisory Council.

MR. SIMONS: Scott Simons, South Carolina DHEC, Regional Office in Aiken.

MS. WILSON: Shelly Wilson with South Carolina DHEC.

MS. HAYS: Brenda Hays, DOE-SR.

MS. BETHUREM: Nancye Bethurem, SRR.

MR. DEVASER: Great. Thank you,

everybody. And if I could remind everyone to sign in on the sign-in sheet here. It's at the table just -- at the break I might pass it around for everyone to sign.

Now I can extend opening remarks -- anyone?

Gregory, did you want to say anything?

MR. SUBER: Oh, sure. Thanks. Once again my name is Gregory Suber. First of all, I'd like to thank everybody for coming to participate in this meeting. When we first came down we thought it would be important to do an up-front presentation here in South Carolina of some of the findings that we had and some of the conclusions that we had in our TER and, of course, in the Type IV letter of concern.

So we welcome some open dialogue and some positive technical exchange during this meeting and hope that it will be productive.

MR. DEVASER: Linda, Sherri? Anything to open up with?

MS. SUTTORA: My name is Linda Suttora, and I work at DOE Headquarters, Department of Energy Headquarters, for the Office of Environmental Management and I'd like to thank everybody for participating and attending this meeting. It's always very helpful to have public meetings and be able to provide status of projects.

Do you want me to just head right in?

MR. DEVASER: Well, there were a few more things I had to say --

MS. SUTTORA: Go right ahead.

MR. DEVASER: -- or I had to go through just before we get started.

Shelly, did you want to say anything?

MS. ROSS: No, thank you very much.

MR. DEVASER: All right. So just a reminder, this is a Category 2 public meeting by way of NRC's public meeting styles which means that the public is invited to participate in the meeting and has the chance to ask questions at certain points identified in the meeting.

However, I'm not sure we actually -- well, we do have at least one member of the public so I'll make everyone aware of those times when they happen.

So the style of the meeting was going to be really the first half of the meeting prior to the break, which I believe is about 2:30 or so NRC was going to go through just an explanation of their monitoring process and where -- that's under 3116, and some of the history of the project.

And then I believe DOE was going to have a similar-type presentation. So what I wonder is if I *should go ahead and get started. Yeah, okay.*

All right. Well, okay. Great. So as I mentioned, we're going to go through some of the history of the monitoring process with NRC and how it fits under NDAA. I'm going to explain monitoring itself and then I'm going to hand it over to Dr. Christianne Ridge here, who's going to go through the PA analysis that we did over the past couple of years and some of the results that came out of our technical evaluation report that came out in April.

Slide 3. So the background here is that in 2005 Section 3116 of the National Defense Authorization Act was signed which said -- it was two pieces there. In Part A we provided consultations to DOE during development of their Saltstone waste determination during which time we published a technical evaluation report.

Following that, the final Saltstone waste determination came out. Some years passed. We put out a monitoring plan for the Saltstone facility in 2007. We've had twelve on-site observations since and multiple technical reviews.

And then in 2009 DOE published the revised Saltstone performance assessment and over the next year and a half or two years we went through a couple of rounds *of questions and multiple public meetings to discuss the performance assessment and develop an analysis.*

In April of this year, NRC published its technical evaluation report documenting this review. Alongside with that we submitted a Type IV letter of concern. Type IV is some jargon that comes from our guidance document, our draft interim guidance document, NUREG-1854, and it's an early letter in the process that just states that we have some concern about DOE's ability to meeting the 10 CFR Part 61 performance objectives.

And at this point I can pass it over to Christianne Ridge.

DR. RIDGE: Sure. And since we have people on both sides of me, I was thinking I might stand up. I don't want to have my back to anybody.

So Nishka thanked you already for having up here but I want to reiterate that. You will notice, some of you, that some of the information we're going to present here today we presented in a public meeting on May 7 but we did want to come down to the site and we're very pleased to be here.

We thought it was important to have a meeting even though it's going to reiterate a little bit of what we said on May 7, we wanted to have a meeting closer to the site. So that is what you're going to see *today.*

And just to start off, the very beginning -- for our regulations that are relevant to our reviews for the DOE performance assessment for the Saltstone Disposal Facility, our low-level waste performance objections, there are four of them.

I'm going to be talking today mostly about this first one. Our conclusions for our review -- I'll cut right to the chase -- is that we had reasonable assurance that DOE was going to meet these three performance objectives -- protection of individuals from inadvertent intrusion, protection of individuals during operations, and stability of the disposal site after closure.

Our technical evaluation report -- I may lapse and call that a TER, but that's what it is, a technical evaluation report. We concluded that we had reasonable assurance DOE was going to meet these three.

We did have some questions about the first one, the first performance objective being protection of the general population from releases of radioactivity. And essentially what this means to us is that we hypothesized that in the future there is a person living a hundred meters from the Saltstone Disposal Facility.

Now, of course, right now that's an

impossibility because all of that land and a much larger buffer zone around it is owned by DOE and it's the extensive Savannah River Site.

So when we say off site, which I'll say when I'm describing this protection of the general population, we hypothesized that the general population is living 100 meters from the Saltstone, the much smaller Saltstone Disposal Facility within the Savannah River Site. I want to make that clear because sometimes NRC and DOE use the term "off site" differently.

Now I'm going to talk about the basis -- I going to talk for a few slides about the technical basis for our review conclusions. And I'm going to talk primarily about DOE's Case A, which they call their base case, meaning it's their most expected case, and I'm going to talk about an alternative sensitivity analysis they ran called "Case K."

Essentially, the NRC technical staff had a number of questions about the DOE base case and he did not think it was and appropriate case to use as a most-expected case. This is a point on which we disagree, the NRC and the DOE disagree.

The base case, as we interpreted it, and actually I don't think there's a lot of interpretation here, as DOE stated -- the Saltstone doesn't fracture *within their 20,000-year-analysis period. So there is no fracturing inside the monolith. There's some degradation in the disposal vault but the saltstone remains essentially intact for a 20,000-year-analysis period.*

In addition, almost all of the water is shed by a drainage layer that's above the disposal units. And that is true for almost the entire performance period. Now, the performance period -- I mentioned a 20,000-year-analysis period. The performance period we agree is about -- not about, is 10,000 years. DOE for its internal purposes uses 1,000 years but for the incidental waste evaluations that the NRC is involved in, we use 10,000 years and that's because 10,000 years is what NRC uses for commercial low-level waste sites.

Again, I said we agreed and that we agreed on the performance period in the context of incidental waste. DOE internally, of course, uses 1,000 years. But for essentially all of this 10,000 years, almost all is water and when I say almost all, for example 8,000 years, 99.8 percent of the water that makes it through the cover is shed around the disposal units.

Now that result, that intermediate result, relies on very good performance of the roofs of the disposal facilities and very good performance from the *drainage layer itself. Probably the high hydraulic conductivity of these lower layers is certainly as important as the very -- I'm sorry, a low hydraulic conductivity, meaning it does not let a lot of water in, of these lower layers is as important as the high hydraulic conductivity of the drainage layer itself.*

So we talk about the performance of the drainage layer but that, of course, relies on the properties of this drainage layer as well as this saltstone and its roof remaining virtually intact for very long periods of time.

Now, these assumptions that I pointed out are assumptions that the NRC has questioned. The lack of fracturing is important because of water flow. It's also very important because it limits saltstone oxidation. And we are concerned about that because we don't think there's a solid basis; we're assuming that there is not so some fracturing during the 10- or 20,000 years after the closure of the facility.

We recognize that it's very difficult to predict fracturing in a somewhat novel arrangement of these large cementitious structures underground for these very long periods of time. We recognize there aren't a lot of good natural analogs and that's a difficult problem but we don't think that the assumption *that there is no fracturing here is well supported.*

In fact there is some fracturing there now. Now, the fractures that are there now are not through-going fractures. I mean, they don't go from the top to the bottom. And that's very important in the sense that right now they're not fast water pathways going from the top to the bottom.

But any amount of fracturing provides additional surface area for oxidation and that's not currently in DOE's base case model. And, of course, there's even more uncertainty once you start talking about these very long time frames. That's one of our main concerns about the base case.

As I mentioned, we are also concerned about the support for the amount of shedding of water and this last bullet point I had really is related to the first one. The amount of oxidation, of course, is very related to the amount of fracturing. Oxygen comes in in water; oxygen can also come in through gaps in the soil itself underground.

Even though it's underground, depending on where it is, and this is unsaturated soil so the soil's not saturated with water, there is oxygen in the soil gases and so any fracturing here would lead to more oxidation of the saltstone. So in a nutshell, those are *some of our main concerns about DOE's expected case, Case A.*

Now, we asked those questions -- we mentioned earlier -- Nishka mentioned there were two grounds of requests for additional information and what that means is that we would ask DOE for more information on certain technical topics that we felt we needed more information on in order to be able to make a conclusion.

And we expressed these concerns about the base case in these requests for additional information. DOE responded by giving us what they termed a "sensitivity case" which is called Case K. And I'll be essentially talking about Case K for the rest of the presentation.

Case K is really the basis for our review conclusions. We did not feel we could really base our conclusions on the base case, as I outlined. And so we based our conclusions on Case K, more specifically Case K1, which I'll talk a little bit more about that on the following slide. It's a slight, slight change on Case K.

But essentially Case K is very different, in that it does hypothesize the formation of through-going fractures. In fact, it hypothesizes one entirely full-width through-going fracture every ten *centimeters by the end of 10,000 years. So they didn't skimp on the fractures in Case K.*

Oxidation, which is another thing that I pointed out we were concerned about -- oxidation proceeds from all of this surface area as time goes on. There are additional modification in Case K that address aspects of water flow, address aspects of biosphere. I'm not going to go into all of those details today but this Case K addressed a number of the concerns that we raised in the request for additional information.

Other concerns were address through alternate means, but Case K wrapped up a number of the concerns that we had listed, and so there are these additional differences, many of them related to water flow which is very important to this analytical problem.

So I mentioned -- when I say Case K, Case K is really -- Case K is Case K1 and Case K2; they're nearly identical. There's one important difference between these three cases, and that is the sorption coefficients for technetium, meaning how well technetium is held in the saltstone and in the disposal unit concrete.

It's a parameter that tries to take account of a number of chemical phenomenon, and it characterizes how well technetium sticks eventually in the saltstone *and the disposal unit concrete. The only difference between these three cases is that the sorption coefficients are different.*

Of these three, the NRC staff thought that the sorption coefficients that were most supported -- best supported and most consistent with DOE's recent research were the sorption coefficients used in Case K1. So I'm going to be talking about Case K1 for the duration.

Now, DOE characterized this case as a pessimistic sensitivity analysis and has referred to it variously as pessimistic or worst case or, essentially, not at all what they expected to happen but they were trying to bound how bad could it be if these things that NRC documents about all turned out pessimistically, turned out not how we wanted.

And we disagree with that. Certainly there are aspects of case K1 that appear to be -- this is a tricky word -- the aspects of Case K1 that appear to be pessimistic. I don't know how much saltstone is going to fracture in 10,000 years. I don't know that. I think it's a very difficult technical problem to predict how much saltstone is going to fracture in 10,000 years.

In Case K saltstone is certainly what I would call thoroughly fractured. Now, I could be proved *wrong. DOE is going to do, they tell us, more research to try to support how much fracture there's going to be in 10,000 years, and I don't purport to know that and I'm not saying at this point anything about definitive conclusions on that because DOE is still researching that.*

But certainly, to me, it seems like they didn't skimp on the fractures. I'll put it that way because that's not very quotable.

But there are other aspects of the case that I would not call overly pessimistic. For instance, the radium 226 inventory and its ancestors, the inventory of thorium and uranium that are its ancestors, went down dramatically and this may very well be supported but it's certainly not pessimistic.

In the base case, radium, largely because of the inventory of its ancestors, is the most risk-significant radionuclide in the base case analysis. In Case K it's technetium. I mentioned technetium because I was talking about the importance of the technetium sorption coefficients. In the base case analysis radium is the most risk-significant radionuclide.

In the Case K, it's technetium. That's because largely these inventories went down *significantly and those may be supported, and I'm not saying they're not, but they're certainly not a pessimistic worst case.*

Similarly. the hydraulic conductivity of saltstone that was used in Case K was in line with what they're finding in recent research, is in line with what DOE is finding in recent research. So I'm not putting this on the slide to fault the hydraulic conductivity that was used, but I certainly don't think we would call that value overly pessimistic.

The assumptions about the technetium and sorption -- now, as I mentioned we thought of the three, K, K1, and K2, the values used in K1 were the best supported. They may even be mildly optimistic, but certainly I would not call them pessimistic.

The assumptions about fracture timing I would say were certainly not pessimistic, and I'm going to talk a little bit more about these last two so I'm not going to go out on this slide. Assumptions about fracture timing and assumptions about technetium retention in the disposal unit floor -- so after the technetium has left the saltstone waste floor, the assumptions about how it's held in the disposing unit.

These last two I'm going to talk a little bit more about both of these because they turned out to be very important to our review. Now, this graph -- I need to point out this is two things superimposed. This is a DOE graph, essentially. These dose peaks here, this is a DOE graph.

This red line is something that we superimposed on a DOE graph and I'm going to talk about both of these. I talked about cases K, K1 and K2. These peaks are dose peaks predicted for those three cases. This is the dose peak predicted for Case K; this is the dose peak predicted for Case K1; this is the dose peak predicted for Case K2.

They all occur after 10,000 years which, as I mentioned earlier, is the period of performance that we are looking at. These are all due to technetium, essentially. There are other smaller peaks in here that are due to other radionuclides but these peaks here are due to technetium.

Now, technetium is interesting in that when it is chemically reduced, it is very immobile. We don't need to dwell on exactly what it means for it to be chemically reduced. I'm sorry. To some of you guys, it's old hat, and to some of you it's not. But, essentially, if there's a lot of oxygen around, technetium moves very fast. If there's not a lot of oxygen around and you've managed to chemically reduce it *and there's no oxygen around to act on it, then it moves very slowly.*

And so what does -- these peaks, the timing of these peaks that are driven by is essentially how fast technetium's getting oxidized because once it gets oxidized, it moves very rapidly. How fast this oxidation takes place and when this oxidation takes place has a lot to do with when the fractures in saltstone show up.

And this red line that I've superimposed on this graph is a graph of essentially one over the fracture spacing so it shows the fractures growing in and they grow in in earnest -- as you can see, this is -- right down here; I don't know how well you can see this but this is 6,000 years and this is 8,000 years.

They're really starting to grow in in earnest around 8,000 years. This is logarithmic growth so that assumption was essentially just an assumption to see what would happen and that's perfectly appropriate for sensitivity analyses. Sometimes you don't have a good physical basis for making a prediction; you're just asked to predict something that people don't know.

And in this case DOE pick logarithmic fracture. Now that does two things. One is it makes the fractures grow in very suddenly and this is a *conservative assumption, most definitely, because the faster they grow in the faster technetium is going to be released essentially all at once. And so that makes the dose peaks higher because it grows in so rapidly.*

Now it also means that very little fracturing happens between 1- and 2,000 years, 3,000 years, 4,000 years -- very little fracturing is happening. And the fracturing happens relatively late in the performance period. This is a concern to NRC.

As I said, we understand that, in sensitivity analysis especially, it is completely appropriate to use these hypothetical arguments. That's what a sensitivity analysis is for. You say we don't know what will happen if the fractures grow in logarithmically. What will happen if they grow in linearly? What will happen if they grow in quadratically?

Well, if it started fracturing earlier and more slowly these dose peaks would most likely be lower but they also may very well occur before 10,000 years, 10,000 becoming a very important number because, as I said earlier, this is the period we're using as our period of performance.

So essentially, because this was a hypothesis, a hypothetical test, what will happen if you *strike and throw in logarithmically? There's very little certainly in the timing. There is enormous uncertainty in the timing of when this fracturing happens.*

And so suddenly these fractures taking placing at around 7,000, 8,000 years and the Tc showing up after 10,000 years is really not that certain. We don't know. We don't have a lot of confidence when these dose peaks are going to occur and that's a very important part of our conclusion that we do not have reasonable assurance of these peaks to be predicted were going to occur after 10,000 years.

And so I said I was going to talk about two assumptions in more detail. We've talked about one of them. I talked about the timing of fracturing. The other assumption I said I was going to talk about in detail -- there are assumption about technetium retention in the disposal unit concrete. So technetium leaves the saltstone and then it hits essentially the floor, also a little bit of the walls of the disposal unit.

And we looked at what we call intermediate results of DOE's model. So there's the results, the model's output concentrations at a hundred meters, doses. There's measures like that. But you can also go *back into the model and look at what we call intermediate results which are any number of things: flow rates, concentrations at more upstream points.*

So one of the things we looked at when we looked at these intermediate results was the inventory of technetium, the fracturing inventory, so we take the whole inventory being one. This is just essentially the fraction that's left in two things. The blue line is saltstone so it's the fraction of the technetium that's in saltstone, and then the red guideline is the fraction of the initial technetium inventory that is in the disposal unit.

And what this graph showing is a few interesting things actually. One of them is that this line where the technetium leaves saltstone so rapidly -- that is essentially that would be leading to a pretty high dose because the Tc is all leaving saltstone at once.

Now, again, that is in part an artifact of how suddenly the fracturing takes place so part of that is certainly conservative. The suddenness of this line relates to the suddenness of the fracturing. It's a little bit more complicated than that but those two things are very closely related.

The other thing this is showing is that *essentially all -- so this line actually comes up to .93, this peak, this red peak. Essentially all of the technetium that leaves the saltstone ends up sitting for a little while in the disposal unit. The disposal unit floor is much smaller than saltstone.*

So what this means -- this is showing the fraction of the total inventory but what this means in terms of concentration is that the disposal unit is becoming 13 more times concentrated in technetium than the saltstone ever was. It really becomes a new source; it becomes the de facto source in the transport equation. And because there were different assumptions made about fracturing and sorption, the technetium leave the disposal unit a lot more gradually than it left the saltstone.

So the dose usually isn't actually related to this -- it's related but it's really governed entirely by the steepness of this line; it's governed by the steepness of this line because this is showing how fast the Tc is going into the environment and that diminishes the dose peak as compared to if you looked at it just coming out of the saltstone itself.

Now the concern here is that that assumption that it's becoming much more concentrated in the disposal unit relies on the disposal unit not being very fractured *itself and we don't think that there's a lot of support for that assumption. The disposal unit is more exposed to the environment than the saltstone. It's thinner. We certainly don't know why it would be less fractured and more able to retain the technetium than the saltstone itself.*

And so we have a lot of concerns about this aspect of the model as well. We think it is unrealistic that the disposal unit would become more than ten times more concentrated in Tc than the saltstone itself ever started out as.

So I'm just about summing up. I know I've been talking at length. Essentially DOE predicted the K, K1, and K2 peak doses are greater than 25 milligrams. I didn't point out exactly what they were. They were in the range of 50 to 90 milligrams. But the peak timing is extremely sensitive to assumptions about fracturing. And we don't feel that those assumptions are very well supported at this time.

We also saw those unexpected intermediate model results that I talked about, the reconcentration in the disposal unit floors and we did our own sensitivity analyses to sort of test the implications of what the intermediate model results were doing. I'm not going to be able to talk about those sensitivity analyses much *today but essentially what that comes down to is that we based our conclusion on DOE's results except that we think that there's so much uncertainty in the timing that we didn't think we could have reasonable assurance that those peaks that DOE predicted occurred after 10,000 years. Those are the DOE results we based our conclusions on.*

Now, in addition, we did a number of sensitivity analyses that I'm not going to talk about today which boiled down to kicking the tires of that conclusion. We looked at a number of different intermediate results and why they were happening and what would happen if you made alternate assumptions. And we essentially, after doing that, think that the dose peaks are in that range that DOE predicted but with this enormous uncertainty in the times.

So we expect -- these are the conclusions that we had in our technical evaluation report, the peak dose at a hundred meters from the Saltstone Disposal Facility to be approximately 25 to 100 milligrams. The uncertainty of the time certainly is important. As I said, these were based on DOE K, K1 results and supported by our independent analyses.

Now, just as important to us as these review conclusions are conclusions about what we need to *monitor. This is a list of the main areas we said we very going to monitor: inventory; infiltration and erosion control; hydraulic performance of the waste form; physical degradation of the waste form, which relates a lot to fracturing which I've dwelt upon a lot today; waste form chemical performance, which relates to the technetium sorption that I've also dwelt on a lot today; disposal unit performance -- again, both sorption and fracturing; subsurface transport; environmental monitoring; radiation protection; site stability.*

And the two that I've talked most about today are these two. The others are important as well. These two, I think, would probably be the two most important. And with that, I will turn it back over to Nishka who will try to get us back on schedule.

MR. DEVASER: Oh, no, no. We're actually not that bad off.

MS. SUTTORA: Okay. Thank you.

MR. DEVASER: We got started a little bit late. Thank you, Christianne.

All right. So, then --

(Pause.)

MR. DEVASER: So the following April was -- following the analysis that Christianne just went through of DOE -- we had a public meeting in April and *then, what, two in May, and this is the third following publication of the TER. In early June DOE provided to NRC any research that had come out since between April 2011 and roughly April 2012 -- August 2011 and April 2012.*

Following that, DOE responded to the Type IV letter and the TER in two letters, one in June and one in July just -- both in July -- early July and then the last one last week and that's really going to be the crux of the second part of this meeting.

We're going to have a discussion about some of the research results that came in June and about both letters but since we only received the second letter more recently, we're going to focus more I think on the first --

So with that, the path forward -- from the analysis and the TER we're going to be updating, revising the Saltstone monitoring plan. There's going to be some public meetings also to come on that and that's going to involve discussions with DOE and South Carolina DHEC.

And with that, really, I can go ahead and hand it over to Sherri and --

VOICE: Linda.

MR. THOMAS: Can I ask a question?

MR. DEVASER: Yes. Absolutely.

MR. THOMAS: Timing right now, once you take on the draft monitoring plan?

MR. DEVASER: That's a tough question. I believe we're going to be -- I think in the next month or two we're talking about handing the draft monitoring plan to the state, South Carolina, for comment. So --

MR. SUBER: We're working through the monitoring plans in parallel and as you know we finished the F-Tank Farm monitoring plan before we're going to complete the Saltstone monitoring plan. Right now we're going through preliminary view in coordination with the state of South Carolina because, you know, we do monitoring in coordination with the affected state.

So currently we are coordinating with the state of South Carolina on the F-Tank Farm monitoring plan and after we get that done -- we're trying to make the monitoring plans as similar as -- we know they're different sites and we know they're different applications but we're trying to make the monitoring plans as similar as we can, you know, not to confuse us and not to confuse DOE and not to confuse the state of South Carolina.

So presently we are still in that coordination stage and after that we'll finalize the F-Tank monitoring and then we'll move on to Saltstone.

MR. DEVASER: Would you anticipate the same type of process? As you pointed out, we just -- DOE had the opportunity -- is in the opportunity of reviewing the F-Tank Farm monitoring plan after the state and obviously you guys have done that. So do you see the same thing happening?

MR. SUBER: Yeah, we would like to move with the same program, try to make it as consistent as we can and try to get as much input and feedback as we can to help make the products useful. And that's really the purpose of the coordination, especially with South Carolina, is to make sure that the product that we're putting out is going to be a useful product, both for the NRC in its monitoring goals, for the state of South Carolina in coordination with the NRC, and just documenting what we planned on doing at the site.

MS. SUTTORA: Linda Suttora again and I'm from DOE Headquarters and I work primarily with the Savannah River Site on a variety of environmental regulatory activities and working on the 3116 NDA Section 3116 work probably takes a good more than half of my life so I've got a lot of experience on this.

So as you've all heard, the Saltstone Disposal Facility performance assessment was revised in 2007 and sent over to the NRC for their review in 2009, *and we -- as has been mentioned in some previous meetings, we have a very significant performance assessment maintenance program and work continues from the moment we issue it until the next time it's revised.*

There's never an end -- we have a never ending research and development program on improving our knowledge of the facilities so -- you will hear mention of that in a few moments. So again we started the revision in 2007 and the way that we -- we are pleased the way NRC was able to do their review because one of the things NRC's review did do for us was confirm that we do meet the DOE requirements.

In the past when we have a facility such as this facility, we've had NRC consult even prior to the Section 3116 passing in 2005. We have always requested NRC's consultation, particularly high-low waste facilities or facilities that will be managed as low-level waste facilities because it was a good idea to get a peer review, another technical organization's peer review.

And so when NRC did review the 2009 performance assessment, they confirmed that we did meet our own DOE requirements which are found in DOE Rule 435.1-1 which is safe performance objectives as NRC uses in 10 CFR Part 61, plus a few more. And we have a *compliance period in the DOE requirements of 1,000 years. There's a slight confusion I have -- and we can talk about this later if you wish, Christianne mentioned that NRC when they regulate low-level waste disposal facilities, they regulate to 10,000 years and DOE order requires to 1,000 years.*

In actuality, I don't think NRC Headquarters has any disposal facilities that they regulate to 10,000. The agreement states that actually do the regulation of the low-level waste disposal -- commercial low-level waste disposal facilities and most of those are in the 1- to 5,000 range for period of performance.

So there's a little -- Section 3116 doesn't specify a period of performance and it doesn't specify that we use NRC guidance for period of performance. It just specifies we use performance objectives in NRC, 10 CFR, Page 61, so there is a slight little bit of confusion and difficulty over the analyses results. But, be that as it may, we do -- both agencies do acknowledge that our reviews have shown that we meet the performance objectives within 1,000 years.

Mention a little bit that DOE self-regulates our low-level waste disposal radioactive waste management under this DOE order 435.1 and where the *requirements are found in the DOE Manual 435.1-1 and South Carolina DHEC who are present here, and can speak for themselves if they wish, regulates the Saltstone Disposal Facility under a landfill permit, a special landfill permit, and conducts routine monitoring as part of those activities and has been for many years prior to the bringing NRC into the Section 3116 activities and monitoring because the Section 3116(b) monitoring activities.*

So we have many similarities with 10 CFR. In fact, 10 CFR 61 came out first and when DOE Order 435 was in development we heavily plagiarized 10 CFR Part 61. So they are very similar regulations for a reason; it wasn't by accident. And, as I've already said, that we've already been in regulation. So in the DOE manual, 435.1-1 -- our manual is divided into chapters and the chapter on low-level waste management is found in Chapter 4.

In fact, the -- just as 10 CFR Part 61 is undergoing some revision, so is DOE Order 435.1; however, we aren't really changing many of the requirements that are associated with this. It really is affecting other sections primarily. But the majority of this order will remain the same for this section -- just it's not going to be called Chapter 4 anymore. They're revising the *actual format of the order which is really more confusing.*

However, be that as it may, we still have the same point of compliance of a 100-meter buffer zone with the assumption that we could lose institutional controls in the borders of the Savannah River Site and other DOE sites might -- the management of those might get lost over time. So we all use the same 100-meter buffer zone. And, as I said before, we have the 1,000-year period of compliance.

So when DOE does a performance assessment for a low-level waste facility, and we have several low-level waste disposal facilities around the nation, we recognize that there are many uncertainties associated with modeling and projecting doses to the future member of the public or to an inadvertent intruder and to the environment. and so we developed several cases, and a case is a whole set of assumptions that we put into the model.

And we develop a bunch of standard cases for that facility for that site and we do it very site-specific because what happens in South Carolina is not the same thing that happens in Idaho or Washington State or Nevada. So we do consider a variety of situations for each site in its own and the kind of waste *that goes there.*

And then we consider -- then we do sensitivity analyses so the plus and minus bar on either side of those assumptions -- to try to get an idea of what the future holds and when we get an idea of what the future holds based on what we consider fairly conservative assumptions we have an expected case and then we have more conservative cases for these analyses.

It gives us a better picture of what's going to happen in the future although, as I said, none of these assumptions and model cases are considered predictions of the future; they're more considered what we think might happen possibly. I mean, there's no cut or dry predictions.

It's just like then when you read in the newspaper about a certain percentage of the population will die in car wrecks. It doesn't -- you can't predict that one person in front of you in line in the grocery store, whether they are going to die or not in a car wreck. So it's the same kind of predictions. We have assumptions and we develop these predictions -- non-predictions, assumptions.

So as we get new information, which we get all the time, we roll that in to the model and some cases we get vastly new information or big chunks of new *information based on a research project and then we roll that in for the next update.*

And, in fact, when we're constantly doing these updates -- we do an annual review of the performance assessments and if, based on the newest information we gain, it looks as though there is something unusual going on in the disposal facility, or could go in the disposal facility that had not been predicted before and if that is considered a significant difference than we thought of before, we start from scratch and redo the performance assessment from the ground up.

And typically a performance assessment is seriously reviewed -- as I said, we do it on an annual basis but also we do kind of a much more significant review about every five years, even if we haven't found any major changes. And then typically between every five and ten years we redo an entire performance assessment from the ground up.

When the performance assessment is redone and, as I said, it's a very significant, expensive process to do performance assessment because of the expense of modeling and then taking the model results and analyzing them to see the performance of the facility -- that the new performance assessment *undergoes a rigorous technical review put together by a peer review team of folks from across the complex.*

So if Savannah River Site is getting their performance assessment reviewed, then -- and they have several for this site because we have a low-level waste burial site; we've got Saltstone; we've got other facilities that have performance assessments -- when they have one we bring in DOE folks and consultants from across the complex; we bring in academics; we bring in national technical experts to be part of a five- or ten-member team.

They tear apart the performance assessment, they come to the site, they do an on-site review, and they write a report, and if they have key findings, significant findings, then it doesn't get approved; it goes back to the site and they're asked to make some modifications and that happens regularly. It's not an unusual event for the review team to just come on site and go, yeah -- it's actually much more unusual for them to come on site and go, yeah, this looks great; yeah, we recommend approval.

MS. ROSS: Never heard of that happening.

MS. SUTTORA: No, I haven't. It's typically have to go back a little bit and do some either additional analyses or additional reviews. And then *after that is done then the review team will write a review report and that goes to headquarters for management approval.*

So we've got a fairly rigorous technical review. For certain facilities, primarily facilities that have managed high-level waste and we're doing a performance assessment, we have in our requirements that they must go to NRC to request a consultant's review or peer review and we have been doing that since the mid '90s, I believe.

Is there anything else?

VOICE: That's it.

MS. SUTTORA: There we go. I'm done. I'm going to introduce Sherri Ross. She is the technical expert on this facility.

MS. ROSS: Just one of many in this room. Okay. Just for those who aren't familiar -- I think everyone in the room is familiar with Savannah River Site but Savannah River Site's about 300 square miles located here between Georgia and South Carolina and the disposal facility we're talking about is in Z-Area, located in the center of the site which is blown up here.

The General Separation Area has multiple low-level waste facilities and radioactive operations and just to give that into perspective, a hundred meters *from the facility is about six miles to the site boundary. As Christianne pointed out before, we do have quite a bit of buffer but we're not taking credit for that although the Department of Energy intends to federally own this property and manage it as an industrial area. We have no plans to return it to the public.*

Here's an aerial photo shot of Saltstone Disposal Facility. So we have Vault 1 and Vault 4. Operations at Saltstone began in the mid '80s, I believe. Right? But we are designing new disposal cells. Cells 2 are planned to go into operation probably later on this month. We are building 3 and 5. These are quite a change in design, an improved design from the original vaults that were used.

So the robust design change, cylindrical 150-foot-diameter, 24-foot-high cylindrical design, 2.9 million-gallon grout capacity for the saltstone. We do blend the saltstone liquid waste with the grout. High-quality Class III sulfate-resistant concrete was used to design the walls in this vault. Minimum eight-inch walls, 12-inch floor, 8-inch roof. We put an epoxy coating on the interior of the cell to prevent from water leeching out, which is an example that we have had occur in Vaults 1 and 4. Interior drain water collection system and just significant design improvements over the *original vaults. We did hydrostatic testing of the disposal cells and they both passed.*

PA development. As Linda talked a good bit about, the new PA development started in 2007 and we built upon scoping that we did between multiple agencies, the Department of Energy, the Nuclear Regulatory Commission, South Carolina Department of Health Environmental Control, and EPA in development of the F-Tank Farm to roll that into this PA development

We use extensive new material testing data and enhanced computer modeling. This is a big change for the Department of Energy. When we went from deterministic -- historically, we've used predominately deterministic modeling at Savannah River Site. This is a hybrid model again like F-Tank Farm with the deterministic and probabilistic analysis and some of the terminology, I think, we're still evolving in that way. Base case has been historically and in the document recognized as our compliance case.

DOE has moved from that into the base case as being like the starting analysis. It's like drawing a line in the sand and you say, okay, here's a set of assumptions and you run your model. It's just a mathematical model based on those assumptions.

But we vary those assumptions, both left and *right, to figure out which model -- what's the model sensitive to? What will provide the higher results? What should we be really concerned about for good support for the analysis?*

And so you come with alternate cases. Probabilistically, you can run that model and vary multiple parameters and you can do that very quickly. It's very timely and cost effective. And so DOE is basing its conclusions on all results, not just one case, not the base case, not Case B, C, D, E, F, but looking at all results, both deterministically and probabilistically, to conclude whether we have reasonable assurance or not.

Provided to the low-level waste disposal facility federal review group, we call that LFRG. If you ever hear the LFRG terminology, that's the in-depth review that Linda was talking about earlier. We released it to NRC and the state in public review in October and formally issued it in November.

This is just a timeline. I'm not going to go through it but it does depict the activities of it ongoing for the Saltstone performance assessment review process. And we did get the NRC's technical evaluation report and their Type IV letter back in April.

And this is just another way to depict what

Christianne explained earlier and so if you look at Case K analysis and the three graphs that are depicted here, the Case K, K1 and K2, I've got drawn here the 1,000-year compliance period and DOE order, the 10,000-year performance period and NRC staff guidance, the 25-millirem objective that we're trying to meet, and the dose results. And what NRC is saying, and they're correct -- there's uncertainty in the timing, in the managing of the peak that can occur and it may be occurring -- it could shift earlier in time if things like the -- depending on how the matrix cracks and how the floor may crack so that's what they're questioning.

To put it into perspective, I've got here identified on this graph doses, typical doses, that can occur so the 25-millirem performance objective we're trying to meet is down here. A hundred millirem is the normal public dose protection standard. We try to allow -- to have operations such that we would minimize dose to the public to be not more that a hundred millirem.

The average background dose in South Carolina is 320. If you consider your typical dental cleaning and X-rays and medical exams, average dose in the United States is around 620 millirems. Five hundred millirem is the performance objective we try to achieve for intruders. So you take that 100-meter boundary and *if you're outside the boundary we're trying to limit you to 25; if you're inside the hundred meters, the standard's 500 millirems and then all the way up to our control limit for our workers. Any questions on that?*

Maintenance process. We have maintenance plans to address uncertainties and gaps in data. That considers research -- we do research in our laboratories. We try to do field studies, get field samples. Environmental monitoring -- we actually do test the groundwater to confirm that our predictions are being -- we're not being surprised. We do reviews of those maintenance plans on an annual basis to determine if any change is required or we need update on our performance assessment.

Each fiscal year we look at it. We have both F-Tank Farm, H-Tank Farm and saltstone facilities. We coordinate our maintenance programs to -- if we're doing something associated with E-Area, is that telling us something that also applies to the other facilities.

We have identified -- Section 8.2 of the PA does describe the future work we plan for our performance assessment. That has been rolled into our maintenance plan and we've adjusted our performance assessment maintenance plan.

So in 2012, in part, we've considered

technetium Kd sorption testing and column testing, property testing of saltstone under varying conditions, verification of disposal cell hydraulic and physical properties, degradation of saltstone -- these are all the same things Christianne's talking about that we're performing.

One of the things -- and we're going to take after today's public meeting NRC is coming to the site as an on-site monitoring plan activity and we're going to take them and show them the lysimeter program that we've got under way. It's a ten-year program to look at samples, radiological samples, that we're placing in the environmental conditions similar to Saltstone and see how it's leeching. We think we'll gain a lot of data from that.

So DOE has a strong comprehensive program built on the principle of continuous improvement and reduction of uncertainty. The way we've designed this disposal cell we incorporate lessons from our Vaults 1 and 4 activities in redesigning to provide more protection.

Treated salt waste reduces risk from the overall liquid waste program and this is something that's very different, I think, between NRC's role as a monitor in coordination with the state of South Carolina of our *disposal actions at Saltstone.*

Department of Energy is looking at the risk posed today from the storage of this waste prior to its treatment and ultimate disposal, which is in a much more mobile liquid form in our aging tanks in an F- and H-Tank-Farm.

So we're looking at the overall risk -- the risk today and the risk to our workers and the risk to the public from today's activities and treating this waste and putting it in disposal cell to move forward, knowing that we may not have all the answers but we have research programs in place and the ability to take additional actions, install different barriers, if necessary, as we learn and move forward.

As Linda mentioned, we do believe NRC's comprehensive review validates the current and planned future disposal actions are safe and we look forward to closely working with NRC, and as new information becomes available, we'll fold that into our analysis.

So Path Forward. As Nishka mentioned, DOE submitted new information to NRC on June 13 and on July 12 that we're going to talk about further today. And we did just submit just a week ago some additional information in response to the TER that will be subject to a subsequent meeting once you've had a chance to digest *that -- quite a bit of information. And that's all I have.*

MR. DEVASER: Thank you, Sherri.

Any questions?

MS PATTERSON: I just want one clarification.

(Pause.)

MS. PATTERSON: I'm thinking that the disagreement between DOE and NRC is more timing, not dose, because I think you both think it will be 100 millirem or less, but it's just whether it's 10,000 years or 8,000 years or some --

DR. RIDGE: That is the crux of it. Now, in the presentation today I did oversimplify a little bit. What you said is entirely correct, but when I said that we thought the doses were in the same range as what DOE was predicting, when we looked at the intermediate outputs and we did some of our own sensitivity analyses, essentially what we think is that there are a couple of things going on in the model that we disagree with that are counterbalancing each other.

And so it's not that we subscribe to the entire model because there are -- even in Case K there's a couple of things going on where we think that the Tc is being released too fast and some things that are making it be released too slowly. And those tend to counterbalance.

So what you said is correct. We think it is in that range, and it's the timing that we think is very uncertain. But that's not to say that -- it's not to underplay the uncertainty in the magnitude. That is what we think; that's our best guess right now but we didn't -- we found these things going on in the model that we disagree with and so there is uncertainty in the magnitude as well.

We think it's below 100; that was our conclusion in the TER, but just because we agree on that number I don't want that to overstate the certainty in it, because there are more specific technical things that we've asked DOE to look into that could change the magnitude, so there's uncertainty there as well.

MS. PATTERSON: By orders of magnitude or just kind of noise?

DR. RIDGE: By factors of -- I wouldn't call it noise.

VOICE: I wouldn't call it either one.

DR. RIDGE: Yeah. Somewhere between noise and orders of magnitude?

MS. PATTERSON: I'm just trying to get --

DR. RIDGE: Factors of five, maybe?

MS. PATTERSON: I understand that we've got that we've got 10 CFR 61 criteria that we have to meet --

DR. RIDGE: Right.

MS. PATTERSON: -- but in a real world, 100 millirem, 250 millirem doesn't to me -- and I'm speaking as a member of the public but as member of the public who's worked on the site for 40 years, and I feel like I'm perfectly healthy.

I've been exposed to all kinds of stuff out there. I'm perfectly healthy. I'm thinking we are -- if it's not orders of magnitude and, you know, whether it's 8,000 years or 10,000 years that -- I understand why we're doing this but, in reality, I think we might be in the grass.

DR. RIDGE: I -- yeah.

MS. PATTERSON: That's just a statement. I mean, you don't have to --

DR. RIDGE: Sure.

MR. DEVASER: And you know the 25 millirems is part of -- I mean, it's the law.

MS. PATTERSON: I know. It's the law and I know that it's the law but I'm -- I'm glad to hear that we're going to revise 10 CFR 61, and I hope that what you guys do is -- both sides, DOE and NRC -- present your judgments based on this what -- based on what you have *been through here.*

DR. RIDGE: Uh-huh.

MR. DEVASER: Thank you.

Any other comments or questions?

THE OPERATOR: Do you want to see if there's anyone on the phone?

MR. DEVASER: Has anyone joined us on the phone?

THE OPERATOR: Yes. We do have a couple of participants and if you'd like to ask them questions, please press STAR 1.

MR. DEVASER: Okay. Yes. Could we have the names of the people on the phone?

THE OPERATOR: Yes, let me open their lines.

MR. DEVASER: Okay. Thank you.

THE OPERATOR: Your line is open.

MS. LONDON: Yes. This is Lisa London from NRC.

MR. DEVASER: Hi, Lisa.

And who else is there?

(No response.)

MR. DEVASER: Okay.

(Pause.)

MR. DEVASER: Okay. Well, we're a little *early on getting started for the rest so we could take a -- let's do that. Let's take a 15-minute break, roughly 15 minutes, and come back at 2:30, if everyone's okay with that.*

Thank you, everybody.

(Off the record.)

MR. DEVASER: We're going to get started back here, and Kent Rosenberger is going to open up with a presentation.

The agenda says that we're going to have a portion of the presentation and a portion of questions, but we all feel like that it would be a little bit more efficient to just have questions from NRC to DOE or the other way around just occur throughout the presentation with the public participants' questions occurring at the end of the presentation. It looks like he may have left.

Okay. Well, I'll turn it over to Kent.

MR. ROSENBERGER: Okay. Thank you.

What I wanted to do today is, as we've talked about in the previous two presentations, is specifically go through the technical documents in the two transmittals that we've referenced, the one that we've issued since the April 2012 NRC's technical evaluation report.

Specifically we want to talk about the June

13 transmittal and the July 12 transmittal, and as we said, there was a transmittal on July 26, but we're not going to be talking about that in detail today. So we want to talk about the first two transmittals.

So what I'd like to do is kind of step through each one of the -- I'm going to give a brief discussion of each of these technical documents that were supplied as part of the transmittals.

The purpose today is not to go through each one of them in detail but to provide a brief overview of some of the key information that we're seeing from those reports and then I hope that sparks some -- you know, if you have any questions we can try to answer those today. And if not -- if there's questions that may take work outside of here, then we can take those down and get back to you with those responses.

So the first one is the June 13, 2012, transmittal. There were six documents supplied as part of that transmittal, so I'm just going to kick it right off and talk about the first one, which is the technical document that describes the updated Saltstone Disposal Facility stochastic model using GoldSim, the updated model, and NRC has gotten that model and I'm assuming that it is working now. Is that correct?

We had a little technical difficulties *there.*

VOICE: We got that going.

MR. ROSENBERGER: Got that going. Excellent. So you do have the new model. So it is -- as you probably have realized as you've gone through the model, it is really a complete revision of the model structure, including some things like looping functions for the future disposal cells.

We did eliminate all of the benchmarking factors that were in there that were the cause of some question in the original model, incorporation of height pathways in the saturated zone.

Another thing that we did in this model update is an explicit definition of disposal unit inventories and one of the reasons for that is so that as we can use this model going forward rather than having a single inventory for disposal units is that we can now bury the inventories for disposal units so that we can use this model that we've developed as we evaluate additional information.

And also as we go through and start disposal operation into the new cylindrical units, we can evaluate the impacts of that on a unit-by-unit basis. And then we performed benchmarking of the new model versus the PA Case A and Case K.

So, just very briefly, I want to throw up some of the information that's in the technical document associated with some of the benchmarking results for the stochastic model, and I should point out we're on a deterministic mode. That's a probabilistic model but we run these in deterministic mode so that we can provide direct comparison to the PORFLOW deterministic results.

So the analyses that we've done within the PA I've presented for Case A for Vault 4, the radium 226 comparisons, the flux to the water table and to the saturated zone for radium 226 and Tc 99 from the results we've seen that those are some of the more important radionuclides for Vault 4 and for the future disposal cells, the technetium 99 and the iodine 129.

So, again, as you can see, GoldSim and PORFLOW are certainly different modeling codes with different assumptions and transport parameters but, as you can see, they actually -- the benchmarking is shown with the new model update. We do get very reasonable comparison between the fluxes.

MS. PINKSTON: So the radium inventory that's in this is still the original Case A inventory?

MR. ROSENBERGER: That's correct.

MS. PINKSTON: Okay.

MR. DEVASER: If I just interrupt one -- if *you have a question, open up with your name first and then ask the question, if you don't mind. I should have mentioned that before. Sorry.*

MS. PINKSTON: Okay.

MR. ALEXANDER: This is George Alexander. The intermediate peaks in the Tc 99 in the PORFLOW model, is that due to the time-stepping? Is that why we're seeing those there?

MR. ROSENBERGER: Right. The time-stepping in the base case has the explicit shrinking core model, so as the various modeled volumes change --

So if there's no other questions on that, I'll move on then.

Also, for Case A, this provides a comparison between the PORFLOW and the GoldSim-calculated 100-meter dose results. We talk about these and other, especially -- the sensitivity case that we're going to talk about as part of another transmittal is that in general for Case A the PORFLOW model tracks very well to the time performance over time of the doses, and you can see that the GoldSim model provides results that are slightly higher than the PORFLOW. And, again, that's just the model comparisons there.

For Case K, the benchmarking, again, for Vault 4 with the radium and the technetium, and for the *future disposal cell, the technetium and the iodine, provides information about the benchmarking in the saturated zone.*

Any questions on those? I'll give a little pause at each one. If there's any questions, just let me know.

And, then, for Case K, benchmarking is the comparison between the PORFLOW and the GoldSim calculated 100-meter dose results. So again there are slight differences because of the modeling but, in general, provides very reasonable agreement between the two models.

All right. I'll move on. The next document that was included in the transmittal was -- again, the first transmittal was just describing the model development and the benchmarking of that model. The next document was actually perform sensitivity and uncertainty runs using the model for Case K and Case A.

And so we used that using the updated stochastic model. We did revise some of the stochastic elements due to the model changes and they're provided in detail in the technical document. I really wasn't planning to go into any detail on those but they are all laid out within the document. Question on that?

(No response.)

MR. ROSENBERGER: So when we ran the model for the Case A, this provides some of the uncertainty analysis results there for the stochastic or the results associated with that for Sector B which is dominated by Vault 4 which is in the base case -- within the 10,000 years is what drives at the peak doses.

And so this provides the information that show you specifically within 10,000 years that even the greatest result only provides a dose slightly over ten millirem from the new model.

Okay?

(No response.)

MR. ROSENBERGER: Not sure if this means you haven't had enough time to absorb the transmittals or --

DR. RIDGE: Well, I think we have a couple of comments. I haven't had specific questions on these slides and I was actually looking through your slides trying to gauge the best time to interrupt and jump in.

MR. ROSENBERGER: Okay.

DR. RIDGE: And I don't know if that's now, but I --

MR. ROSENBERGER: Whenever you think is the best time.

DR. RIDGE: I think actually if you -- we'll let you go the next slide. I might want to start on 12.

MR. ROSENBERGER: Okay. Case K? Oh, I'm sorry. Right here. Sensitivity analysis? Okay.

Some of the results that we saw from the sensitivity analysis for Case A is that we saw some similar sensitive parameters to what we saw within the PA, which again was the saturated zone thickness. That's some of the vegetable pathway factors and the fish ingestion pathway factors.

And then, due to the revisions to the model, the Kd value for iodine is no longer showing up as a sensitive parameter. Is that --

DR. RIDGE: Yeah. So if we take the first bullet on this slide, I guess I want to say, overall, a couple of things first, and one is thank you for helping us get things running with those extra files we needed. Everything's running now, so that's good.

We have had a chance to start looking at the model and looking at various intermediate results and that's been very helpful. Essentially we understand that this was a model that was essentially complete or complete before you received our TER.

So as you outline in the document that *describes the model, the model is responsive to a number of the concerns we raised in the RAIs and we've looked at some of that and I think so far a number of those do seem to be improvements. A number of ways in which it was responsive to the RAIs were improvements.*

But we understand this was something that was done before you got our TER. What that means, in part, is that it obviously couldn't respond to a couple of the major concerns we raised in the TER.

MR. ROSENBERGER: Right.

DR. RIDGE: And I would highlight those as -- assumptions about fracturing, assumptions about the retention in the disposal unit concrete, and the use of the average Kd model, I think, were things we emphasized in the TER and the intermediate model results we've looked at so far, unsurprisingly, since you hadn't gotten our TER when you did this show the same kind of behaviors.

So one thing we have had an opportunity to do is to go in and pull out -- and I need to credit Karen with this because when I say "we" did this work, what I mean is Karen did this work.

MR. ROSENBERGER: Let me be clear. When I talk about the model being updated, it isn't me. It's Barry --

DR. RIDGE: Okay.

MR. ROSENBERGER: -- with Richard's help.

DR. RIDGE: Yeah. So we have looked at the same phenomenon of the retention and the disposal unit concrete and the model is doing the same thing as it was. Until -- something that we talked about in the TER is that we think the use of the average Kd model is probably overinflating your result but that this holding it up in the disposal unit and then slowly re-releasing it is then diminishing the peak. And since one of those sort of moves it in one direction and -- one of those moves the peak up and one of those moves the peak down, it's hard to say overall if the peak is too high or too low.

And, Karen, to go back to your question that you had earlier, those could be significant changes. We think they're averaging themselves out and I talked about there being some uncertainty in the final dose number, but -- and I think that those two phenomenon probably both are evening it out and maybe limiting -- sort of canceling each other out.

But either one of those by itself is changing things by orders of magnitude as far as we understand, and so we have looked at this model, and we appreciate a lot of the work that's been done, and it was responsive to the RAIs, but until we get straightened out *this retention in the disposal unit concrete and that the average Kd model, it's very hard for us to interpret the results. It's very hard for us to know and I guess that's all I need to say.*

More specifically, on this slide, the reason I wanted to start here is that when you talk about the sensitivity analysis pulling out the saturated zone thickness, the vegetable pathway factors and the fish ingestion, again, one of the things we emphasized in the TER is that these are certainly interesting results but always, when there's a bullet like this, need to remember that that is if none of the uncertainty in the flow parameters is included in the analysis because --

And I guess since this is a public meeting, I feel compelled -- I know you understand that but since this is a public meeting I feel compelled to say that, that this uncertainty analysis only operates on parameters essentially after the flow has already been computed because the model, even in the revised version, still uses the deterministic PORFLOW as input.

So I think that those are interesting results but, of course, I think the flow parameters may be driving it, and so I would hate to dwell on saturated zone thickness and vegetable pathway too much. Maybe those are parameters 3 and 4, after hydraulic *conductivity or some cover parameters.*

And certainly I'm not doubting that those were the most important parameters that came out of the part of the situation that was looked at probabilistically but we always have to remember that the flow which may be driving the whole, not the whole but certainly sorption is important, but the flow is driving a lot of the uncertainty. I always want to pencil that in.

MR. ROSENBERGER: I understand.

MS. ROSS: But we did vary the flow with the various cases in GoldSim.

DR. RIDGE: True.

MS. ROSS: I mean, Case A, Case B. All those --

DR. RIDGE: So how does this -- when you say that the saturated zone thickness was your most sensitive parameter, in what sense --

MR. ROSENBERGER: I mean, again, some of this --

DR. RIDGE: That's for Case A?

MR. ROSENBERGER: That is for Case A.

DR. RIDGE: Right.

MR. ROSENBERGER: That is correct. These are sensitivity runs run for those specific cases which *were a specific set of flow conditions.*

DR. RIDGE: Right. Okay. So that's if the flow is fixed --

MR. ROSENBERGER: That is correct.

DR. RIDGE: -- and not uncertain --

MR. ROSENBERGER: That is correct.

DR. RIDGE: -- then these are the most uncertain.

MR. ROSENBERGER: Right.

VOICE: That's right. I forgot. This one only is Case A and Case K.

DR. RIDGE: Yeah.

MR. ROSENBERGER: That's correct. But you are correct they are the individual cases so they have a fixed-flow profile that is provided through PORFLOW results. Okay?

MS. PINKSTON: Do you have any -- this is Karen Pinkston. Do you have any sense of the fish-ingestion pathway -- is that due to conservative assumptions or do you expect that that's realistic?

MR. ROSENBERGER: I'll throw that out to --

VOICE: I don't have any details --

MR. ROSENBERGER: Yeah. And you know that the one -- I believe the main radionuclide that that was impacted by was the cesium-135, if I remember correctly.

Is that correct?

VOICE: Well, for Case A, I think it was probably still the radium.

MR. ROSENBERGER: Still the radium, yeah.

VOICE: Only in Case K would that change.

MR. ROSENBERGER: That changed when we changed the radium and then --

VOICE: Well, because also in Case K, we changed some of the Kd values.

MR. ROSENBERGER: So it's not one of the higher sensitive parameters, but it does show up on the list, so it's certainly something that we can take a look at as we're refining all of our uptakes and things like that, some of those factors.

MR. SHEPPARD: Kent, this is Richard Sheppard. I think what really brought that into play more, too, is we didn't revise the dose pathway models based on RAI responses and -- you know, B1, B2, B3, those RAIs, and when we changed the buildup factor in soil, I think that was the major impact on that but --

MR. ROSENBERGER: You had asked before about inventories, et cetera. This Case A is exactly like the PA Case A, so there were no changes to the dose models from any of the biosphere RAIs, from the RAI responses. It doesn't incorporate anything from that *aspect. Okay?*

Then Case K, again, saturated zone thickness is one that we should expect that would always show up, because that is a direct dilution or concentration to the calculated concentrations in the aquifer, so it still shows up. It's a sensitive parameter.

As we said -- Richard had mentioned and Karen had mentioned that in Case K we changed the -- we did make a revision to the inventory. We're going to talk about inventory a little bit in another technical discussion today about inventory.

But we did change the inventory for Case K and some of the Kds, and so therefore the parameters associated with radium 226 go away because -- mainly because of those inventory changes. It's not as significant of a radionuclide to dose. And the inventory and pore volume parameters for iodine 129 show up as sensitive parameters for Case K.

MS. PINKSTON: Is this list of sensitive items -- is this within what time period?

MR. ROSENBERGER: I believe it's within the 10,000-year time period.

MS. PINKSTON: It's within 10,000 years. Okay.

MR. THOMAS: Kent, since you

mentioned it before, why don't you speak to why the radium 226 is --

MR. ROSENBERGER: Yeah. And again we'll talk a little bit about this when we talk about some of the inventory reductions, but in the PA base case, the starting inventory, we had assumed that the radium 226 ingrowth and conservative assumptions about some of the ancestors associated with that -- primarily the uranium 234 and thorium 230 being very high values.

And so therefore we allowed them to reach equilibrium at time zero, which takes a very long time. Even at 10,000 years it's only a fraction of the total ingrowth but for -- and these are some of the lessons learned when we're doing our PAs, is that we made a -- that one was a pessimistic assumption.

I feel very strongly about that that was a very pessimistic assumption about the radium inventory, and when we did that radium showed up as the key radionuclide, and that caused us a lot of discussion about radium and what do we know about it. And so one of the things that we looked as for Case K and also when we did the inventory recalculations is to take a look at what's a more realistic value.

We're going to talk about that when we talk about the inventory recalculation, and specifically *we're going to show some more of the tables in tomorrow's monitoring visit which was also part of the one technical transmittal. I just didn't happen to provide that table in today's slides.*

To respond to one of your comments about whether the inventory was really conservative in Case K, or pessimistic, I should say, or not is -- I think you're going to see is that mainly for the uranium and the thorium. We believe that it is.

DR. RIDGE: Okay.

MR. THOMAS: To re-emphasize -- this is Steve Thomas -- that we did assume that it was an equilibrium with the parents --

DR. RIDGE: Right.

MR. ROSENBERGER: Correct. For the PA.

MR. THOMAS: -- at time zero.

DR. RIDGE: In Case A, you did, and then in Case K it was revised down.

MR. ROSENBERGER: Correct.

DR. RIDGE: And I hope -- now that we're having this conversation, I think I may need to rework that slide a little, but I did not mean to indicate in those slides that those were all the things that we currently had concerns about, just that they weren't necessarily overly pessimistic worst case, that they may *be more what we would call realistic or something like that.*

MR. ROSENBERGER: I understand. Okay.

Well, inventory methodology. So we'll roll into the inventory methodology technical document that we have prepared.

MS. ROSS: Well, can we --

MR. ROSENBERGER: Sure.

MS. ROSS: I'd like to ask just in general, with the revision of the GoldSim model, the NRC's expressed some quality assurance concerns with the benchmarking factors that were previously used, and looking for your feedback on the overall revision of the model we were trying to incorporate, it is pre-TER.

DR. RIDGE: Right.

MS. ROSS: But with revision of the model you run the multiple cases that provide a much better probabilistic-type analysis of the variability of the system performance. I mean, that's really what we're after. With using the probabilistic we were hoping that would address a lot of your concerns previously expressed with the GoldSim model.

DR. RIDGE: I'm sorry. I don't think I understand what you meant about running the multiple cases. I know in the original version that you had *assigned probabilities to each of the cases and you're no longer doing that part.*

MS. ROSS: And I understand. This one didn't do that. This was A and K.

DR. RIDGE: Right. Yeah.

MS. ROSS: But we did revise the interim model so now the model is hopefully a better product for using with -- in the future.

DR. RIDGE: And I think --

MS. ROSS: I'm hoping that would address --

DR. RIDGE: -- I think it is.

MS. ROSS: -- a lot of the concerns that the NRC raised.

DR. RIDGE: I think it is a better product and, again, it's something we're still looking at.

MS. ROSS: Oh, I understand. Those aren't addressed yet.

DR. RIDGE: Yeah. And there's no fault there. You finished this before you even got our TER, so we understand that, but just in a very practical sense, going forward, I think that, you know, we are seeing some improvements in the model and, again, as I said, we're still looking at it, but --

MR. ROSENBERGER: I mean, from my perspective, you know, we'd love to get feedback on the *new model as you have a chance to go through it, because, you know, if we decide to incorporate some of these different flow regimes, et cetera, into that, we'd be using this as the base to build upon.*

DR. RIDGE: Right.

MR. ROSENBERGER: So, you know, any issues you see with the base product, you know --

DR. RIDGE: I think that's the most important thing we can convey at this -- you know, the most important thing we can convey about the model at this time is that it has such a large effect, these couple of things we're talking about: how the sorption's handled in the floor and, you know, this retention that we're seeing in the floor, and the average Kd model both have such a significant effect on the dose that it's just very hard to interpret the results.

You know, the other improvements are there, you know, that we've seen that there are other improvements there, and I don't want to downplay that, but these other things aren't in the noise, as we were talking about earlier. These other two phenomena really have an effect on the dose.

And we have had time, as I said, to go in and look at where the Tc is reconcentrating, and it does do the same thing. We've in fact also had an opportunity to go in and say, What happens if you get less sorption in the floor?

And, you know, predictively the dose goes up, so it's just a matter of coming to an agreement on those, but unfortunately they have such effect that it's hard to work around that.

MR. THOMAS: Not to belabor it -- this is Steve Thomas. In your TER I think what Sherri's getting to, you actually had some fairly strong statements -- I don't want to paraphrase, but you basically dismissed the GoldSim model because of quality assurance issues, I think is the terminology used.

And I think that's what we're looking at

DR. RIDGE: Yeah.

MR. THOMAS: We recognize that the current model reflects what PORFLOW reflects as far as the behavior.

DR. RIDGE: Right.

MR. THOMAS: And we recognize the questions relative to that. We're trying to address --

DR. RIDGE: Okay. I'm sorry. I may not have understood your question.

MR. THOMAS: -- that specific comment that you made -- NRC made --

MS. ROSS: Let me back up and restate a

little bit differently. I agree with you; I understand what you're saying --

DR. RIDGE: Okay. I'm sorry if I'm belaboring something that's already understood. I just didn't understand your question then.

MS. ROSS: That's okay. I guess I see a major fundamental difference here in how DOE's looking at results and how NRC looked at the results to draw its conclusions, because we're looking at all cases, both deterministic and probabilistic, and it appears, as you've explained, that basically you've thrown out all results except for Case K and predominantly Case K1.

And in Case K1 there's really errors -- I mean, there's really things you'd also like to see in Case K1: the floor and the average Kd value and --

DR. RIDGE: I understand a little better now.

MS. ROSS: -- what I'm sort of trying to figure out is are we headed in the right direction to get back to looking at all results?

DR. RIDGE: Right.

MS. ROSS: I mean, not that it's there yet, but are we moving toward -- because that seems to be a pretty big fundamental difference between --

DR. RIDGE: Yeah. That's not a

philosophical difference. I mean, we didn't set out to say, Okay, DOE gave us a number of cases, and we're going to pick one and focus only on that one.

MS. ROSS: Right.

DR. RIDGE: That's not what happened. We, I think, are in alignment philosophically that you present a base case; you present alternate cases, and you consider all of that information. You consider the probabilistic information as well.

That wasn't, you know, a policy difference or a process difference. I think we are in agreement on -- that that's how it should be.

We didn't really weigh the base case for the reasons that I discussed earlier, and a lot of the alternate cases shared those particular concerns about some that I didn't get to go through today but we go through in the TER.

That's why we focused so much on the one case, is that we --

MS. ROSS: Right.

DR. RIDGE: -- had concerns about the other things.

Now, as far as the specific quality assurance concerns that we had, I guess I would say we just -- we haven't had the model for that long. I think *there were some that we saw resolved, and Karen can probably speak to it better than I could. But I think some of those we did see resolved.*

MS. PINKSTON: Yeah. The ones I had noted in the TER I went through, and those pretty much weren't there anymore, so I haven't found any of the lower-level quality assurance issues in the new model.

DR. RIDGE: Good.

MS. PINKSTON: So I think the points that Christianne raised earlier about doing a sensitivity analysis where the flows are hard-wired -- it's limited, and you kind of always need the caveat of, given that the flow is X, these are the things that are sensitive and know that if the flow isn't X, it's going to be very different.

And then the other issue Christianne noted about the floor.

MS. ROSS: Okay. Good.

MR. HAUER: This is Kim Hauer. You guys might know this, but while we're talking about the modeling here in terms of how we execute our work, we have one in-house that we can do, one that we will get SRNL to run that takes more time and ties up -- so if we get to the point where all of us are comfortable that we can use one to kind of predict the other, we'll be able to *very quickly kind of do some things and say, Okay, this is the one we want to drill down on.*

DR. RIDGE: Right.

MR. HAUER: That's why we're interested in making sure that we're all comfortable on how they're converging.

DR. RIDGE: Right. I appreciate that.

MR. ROSENBERGER: We'll move to the next document, which is the inventory methodology. I'd just point out that conservatisms in the inventory calculations have been a subject of discussion in several of the monitoring interactions and meetings that we've had, especially related to certain key radionuclides.

I know iodine 129 was one that we had had a lot of discussions on, and this talked about the conservative methods that we had, especially with our material balance calculations that we had within the facilities, of why we believed that the previous inventory's estimations for disposal operations weren't conservative. So we had done is develop the methodology for inventory calculations. What we did was --

VOICE: I was just wondering, if there's any way to get some light in here without all the light. Maybe open the blinds? It seems to have gotten so dark.

MR. ROSENBERGER: I look better in the

dark.

(General laughter.)

MR. ROSENBERGER: Okay. As I said, we had recognized the conservative nature of some of the inventory estimations from some of the disposal operations that we had discussed in the past, so we developed a methodology for inventory calculations. We took input from all the impacted SRR groups, from the operations people to facility engineering, to try to remove some of those conservatisms that we had in the previous methods.

And let me just start by saying, I'm going to show a flow sheet that was included within that technical document, but the basis for all estimates is -- the first starting point is from the actual Tank 50 salt solution samples that we take out of Tank 50. So I kind of make an offhanded comment that Tank 50 samples always win. So in the past we had done some material balance calculations where we took those concentrations, and we re-baselined them every quarter.

Every three months we'd take samples out of Tank 50 and do a very detailed, analytical analysis of that material, but if we have a Tank 50 detection, that always is going to win in this methodology. And so I don't want to belabor this flow sheet, and I know it's *difficult for people who haven't seen or been involved in some of these monitoring discussions before, but, again, everything starts with the Tank 50 data over here from the Tank 50 data reports that, again, are taken every three months.*

And then it's stepping through whether or not we have a detection. If it's a detectable -- above the detection limits, then that is the number used, period, for what we use for disposal estimates. And then as you go through that, then we look at various special methods, and I just throw a -- you know, fission yields, as it relates to ratios to something that is very easily detected, like cesium-137, et cetera, so we took a look through that.

We went all the way back to all the available sample analysis reports, all the way back to when we started disposal operations in Saltstone in 1990, and so went back and, again, started from there, and then reconstructed from that point on for all rads that we currently track.

And so I'll point out some of the other things that were done that -- from some of those early disposal operations was now we can say what was disposed of in a certain period between Tank 50 samples, and now we take into account decay from the point of disposal.

In some of the more recent -- in the previous method, decay was only accounted for essentially from the 2006 time period on, so any decay that might have happened, especially for things like strontium and cesium that had happened in that previous 15 years of disposal were not taken into account. Now all that's taken into account, so that's another difference.

And this just provides -- I just threw out -- if you look in the report, it goes through each one of the radionuclides that we evaluate and keep track of, and shows you all of the available data that we have for each rad over time from the first disposal operations in 1990, and provides a key -- you don't see it on here, but the black squares are actual detections, and then reds and greens or open dots mean something different about what method we are using, whether it be a detection or a detection limit, et cetera. So that's all detailed in the report.

The only thing -- I threw up some of these so that -- you know, as a point of reference. When you look at some of our previous disposal operations with very low level material, and then what was nice to me about some of this data that can help is that if you overlay it with our processing operations, disposal operations in Saltstone, you can see when we started to *put in to Tank 50 some of the DDA material, the deliquification, dissolution and adjustment material, which we knew had higher cesium concentrations, so you can see where we hit that.*

And then you can see as we were taking material out of Tank 50 and processing it in Saltstone and now are putting in salt solution from the ARP/MCU process which has much lower cesium concentrations. You can see that concentration steadily trend down, as you'd expect. So it also -- being able to see this data in this fashion, I thought, was very useful to us and hopefully to others as they look at that.

DR. RIDGE: Kent, this is Christianne Ridge.

MR. ROSENBERGER: Yes.

DR. RIDGE: Is there -- just looking at this, you pointed out that the black squares are actual measurements, and everything else that's colored or an open box is something else. Is there any significance to those other things that aren't actual measurements essentially all being lower than most of the actual measurements? I mean, is that because they were just samples with not much in them, and they ended up being at the detection limit or something to that effect?

MR. ROSENBERGER: Right.

DR. RIDGE: Okay.

MR. ROSENBERGER: And something like, for instance, plutonium-238, back in that time period, they didn't even measure for it at that point, so that is another methodology. You can see that we -- on some of these, we really did make assumptions about what the concentration was, based on similar -- you know, if we were running similar material through Tank 50 at that time, when the first sample was taken, so we tried to pick, you know, a reasonable number, but we would tend to err sometimes on the error of a little bit of pessimism.

So we would have expected in these first couple of samples that the salt solution was all very similar. We just picked -- you know, had to make an assumption, so that's all discussed in the documents, so if you haven't had a chance to read through that, I think -- I will say that the document may not look extremely -- may not look like a dissertation, but the amount of man hours that went into assembling that document was intense.

Just the collection of all of the sample reports and the data -- it was a poor intern last summer -- it was good experience for him, but that was great intern work. But a lot of work by a lot of people *went into that, so that's the inventory methodology. Any more questions on that one before I jump to the next topic?*

(No response.)

MR. ROSENBERGER: Okay. We also provided the FY '12 PA Maintenance Plan. Again, the maintenance plan, Sherri and Linda had talked about the maintenance plan, providing information about activities planned for the current fiscal year and out years. And again I want to emphasize "plan," because things change over the years, so this is -- we do this in each fiscal year, and so things can change as we learn new information or have, you know -- I don't want to make it sound like it's set in stone every year, so these things do change.

And it provides a summary of the maintenance activities completed in the previous fiscal year, so it's, again, a nice summary that we do each year and provide to DOE. We're going to talk more about some of the specific items especially tomorrow, when we talk about some of the R&D activities related to monitoring. And I will say that some of these things that we're talking about here are things that we've seen in the monitoring plans before and are continuing to work on.

And so one of those items is a technetium sorption, looking at technetium sorption to cementitious *materials under reducing conditions. As you know, this is something we've been working on as related to our R&D and maintenance activities, and this is specifically related to those assumptions that we made for Kd's when Christianne talked about case A, K1 and K2. So we're trying to get at the reducing Kd value.*

The work that we provided as part of the June 13 transmittal was done with an improved containment system to eliminate some potential hydrogen contamination of the system that we had from a previous -- some work we had done previously, that we had provided as part of maintenance, some of the -- also some of the things that we think is a positive is that we included no-slag concrete control, so it was a cementitious material that had never had slag in it.

So we tested saltstone, the Disposal Unit 2 concrete, made to the Disposal Unit 2 specification, and a high slag content grout for, again, some additional comparison. The improved containment is actually that glovebag that you see there. That was in a -- was done up at Clemson, and so we have a very well controlled atmosphere test for that containment.

Some of the intermediate results that are provided in that technical report were tests out to 56 days. I won't dwell upon the numbers, other than to say *that 547 is the mix that is representative of the saltstone material. I will tell you that these tests -- we did not stop these tests. One of the things that we had discussed and learned about is that depending on the slag content of the cementitious material is how long it might take to reach equilibrium of reducing conditions, so we'll talk about later is one of the things that continued in FY '12 was to continue these same tests, so this system was not shut down after 56 days. It was kept going, and we've been taking samples that we'll be reporting on before the end of this fiscal year.*

DR. RIDGE: Kent, this is Christianne Ridge. I think that the introduction of the no-slag concrete control is, you know, obviously a very good thing and that the explicit consideration of the hydrogen in the system and how you want to handle that obviously is also very good. Now, I think in the interpretation of these results, I think this study probably sounds like -- and we did have the chance to review this.

I think that this study probably is giving you a good idea of the kind of sorption you might get in an absolutely zero environment, where you have a palladium catalyst, making sure that you're taking all the oxygen out of the system, and you've done a good job with the no-slag concrete controls and the lower hydrogen *than you had been using in other experiments, to make sure it wasn't the hydrogen that was reducing things.*

But in the interpretation of these results, I'm wondering what allowance you're making for the other DOE result that in a system that was contaminated with a very small amount of oxygen, you did see that oxygen affecting the technetium sorption, in combination with the other recent DOE study that showed that in the subsurface environment, you would expect -- in subsurface environment at the site, you do expect there to be some oxygen.

MR. ROSENBERGER: Right.

DR. RIDGE: So I think this study, giving you good information at, you know, one extreme, what you would expect if you were in an absolutely zero oxygen environment.

And then I guess my question would be if you wanted to say anything at this point -- and I don't know if this is premature, or if you wanted to say anything at this point on the interpretation of this information when you do have the other DOE study showing that you expect some amount of oxygen in the subsurface, and then the other study you have, showing that even the small trace contamination of oxygen did affect the technetium sorption.

MR. ROSENBERGER: I think I'd only go to the point of saying that based on some of this information in the FY '12 maintenance program, that we looked at not just this result, but also what other things would we need to inform, just what you're saying --

DR. RIDGE: Uh-huh.

MR. ROSENBERGER: -- about the other potential impacts to that results, things like we've got -- and I'm not really prepared to talk in detail about some of the FY '12 testing, because we haven't issued any of those reports yet. They're still ongoing and being finalized as we speak. But one of the things is what we called our field oxidation studies, where we took some saltstone samples and had actually let them sit out in the environment, to take a look at the oxidation front movement and how far it has moved, and then also we developed -- did an extensive method development of what's the best way to measure that.

DR. RIDGE: Okay.

MR. ROSENBERGER: And quantify that, to use in conjunction with this to say, okay, you're right. If it really is reduced and we have a very low oxygen content, these would be the results. Couple that with the work we're doing this fiscal year, that Savannah River National Lab is doing, to develop methods of what's *the best way to measure that or to evaluate the oxidation front movements, and then doing some tests on those field samples that have been sitting out in the field. They had probably been out there about six, seven months of sitting essentially in an uncontrolled -- not a lab environment. I guess that's the point.*

DR. RIDGE: Right, right.

MR. ROSENBERGER: And so we were planning to be able to have that information, to couple that with these kind of things, to try to give some context to this testing. Also, and the other --

MS. ROSS: But those are intact concrete cores. Right?

MR. ROSENBERGER: That is correct.

MS. ROSS: Samples. Versus in the lab when you pulverize it to run the other --

MR. ROSENBERGER: Yes. They are small samples that we can then evaluate these methods that we're developing, and then the other one that I would say that we have going on this year is a column study that's being done at PNNL to look at the changes in the chemistry and things like that, so Eh-pH transition, et cetera. I'd say similar to the one that was done by Southwest Research for the NRC, except in a more -- it's in a glovebox, so it's in a more controlled environment.

Okay?

DR. RIDGE: Yes. I think that speaks to our concerns.

MR. ROSENBERGER: So I want to say, I guess, I agree with you, and we recognize that, and some of our R&D this year has been to try to provide that context for these results.

DR. RIDGE: If you could remind me, when these samples that were used in this study were formed, were they poured and cured in a zero oxygen environment?

MR. ROSENBERGER: No.

DR. RIDGE: Okay.

MR. ROSENBERGER: They were just cured in the lab, just like all of our other --

DR. RIDGE: Okay.

MR. ROSENBERGER: -- lab samples.

DR. RIDGE: Great. Thank you.

MR. ROSENBERGER: And then after a certain time period -- and I don't want to speak out of turn; I'd have to look at the reports. But they sat out in the lab for a while before then they were put into the controlled --

DR. RIDGE: I see. Great.

MR. ROSENBERGER: -- atmosphere.

MS. PINKSTON: And the Tc was added -- was it added when they were poured, or was the Tc added at the point they were put in the --

MR. ROSENBERGER: This is an adsorption experiment, so the Tc was added after the samples were then put into the glove, and the Tc was in the solution. And to contrast that, the column study, it was the opposite. It's an asorption study, so we actually put the Tc into the grout for that study.

MS. PINKSTON: Thank you.

MR. ROSENBERGER: Okay? Again, more of this is -- I'd say, first step in this one; more to come in that particular discussion. We'd also provided some information as we are trying to evaluate different methods to get an in-place grout sample out of the disposal units, so one of the things that we've been evaluating is what we call the formed core. We discussed that in the May meeting.

In FY '11, we performed a proof-of-concept testing to show that we could mock it up and actually get a sample with that sampling system. That test did identify some areas for modifications of the equipment and equipment development. Again, that was the first time that we did a full-scale mock-up.

So that was the June 13 transmittal documents. Take a pause there. Anything else on any of *those documents before I jump into July?*

(No response.)

MR. ROSENBERGER: Okay. If not, then let's talk about for the July 12, 2012, transmittal, there were two documents associated with that transmittal. One is the projected technetium-99 inventory, evaluated the projected inventory for disposal units 2, 3 and 5, and a lot of this was to try to provide information to the NRC about near-term disposal activities associated with saltstone. So what we looked at is based on the current batching plans for Saltstone and where we are right now.

What do we anticipate the technetium inventory to be in those disposal units, again based on current plans? We evaluated two scenarios, and what we mean here is that during ARP/MCU processing, there are chemicals added, et cetera, and adjustments of chemistry, so the salt solution that's actually in the tank farm, by the time it gets to Tank 50, does have some dilution by those processing steps, and there is -- you know, as the process is operating, there's a range of those values.

So what we did is we -- and then also, in the Saltstone production facility itself, as you may vary the water to premix ratio, as you're actually making *saltstone, that can also result in a varied grout-to-salt solution volume value. So what we did is try to look at the bounds of those two, to try bracket the anticipated technetium inventory that we would expect within those disposal units.*

And, again, then the results of that is that we expect that the individual cell inventories will be between 18 and 20 percent of the current modeled inventory of 540 curies. So for all these six disposal -- next six cylindrical disposal units being filled, we're -- again, 18 to 20 percent of the amount of technetium was modeled as the nominal value within the PA model.

MS. PINKSTON: I had a couple of questions about the --

MR. ROSENBERGER: Sure.

MS. PINKSTON: -- projected Tc inventory. The first one: I plotted the concentration of Tc from the quarterly samples over time, and it seems that the values assumed for the concentration for the next couple of batches is lower -- it's in the realm of what has been sent to date, but it's a little bit lower.

MR. ROSENBERGER: Right.

MS. PINKSTON: Is there -- do you know if there's -- what the reason is for that?

MR. ROSENBERGER: Yes. I mean, a lot of that just has to do with where we're getting the batch material from. Some of the ARP-MCU material tends to be lower in cesium concentration. Also, it has some of the DWPF recycled material as a chemistry adjustment to that, which obviously be stuff that's gone through the system and come back, so you wouldn't expect it to have as much from a technetium perspective.

So what we're really seeing, I believe, is some of that dilution of the material over time from the DDA material that was put in there initially, which was higher, more undiluted salt solution. I don't know if anyone wants to --

MR. THOMAS: One other --

MR. ROSENBERGER: -- contribute to that.

MR. THOMAS: -- component of what's being batched through, Karen, is material that came out of the 2H evaporator, concentrated from the 2H evaporator. The majority of that material was recycled that was concentrated, so as Kent said, that's material that's not coming straight out of a salt tank per se, and so you're going to get further, for lack of a better term, dilution of the technetium as a result of that. So it's not unexpected. In fact, it is expected, given the batching strategy.

MS. PINKSTON: And then when looking at the next couple of batches that are being sent, it seemed like, you know, the table that's in the document of all of the next -- you know, the transfers that are going to happen and where they were coming from, it seemed like about the first half of the table was pretty well known. You know, it was what was in Tank 50 now or it was already staged to go, and it had been characterized. Is that accurate?

MR. THOMAS: Yes. That's correct.

MS. PINKSTON: But then the second -- when it got towards the end of the table, it seemed like there was a lot more uncertainty about what exactly was coming. Is that true? Or is it --

MR. ROSENBERGER: I hesitate to say there's a lot of uncertainty there. I mean, we have a batching plan that, because of the time it takes to develop salt batches -- you guys back there, I may need help here. Where we talk about salt batches, it's not something that we change lightly --

MS. PINKSTON: Right.

MR. ROSENBERGER: -- because of the time it takes to prepare whatever we have to do to get that material over to form the batches. So I'd say there's probably a little bit of uncertainty there, as far as *maybe the exact -- you know, if we say now there's going to be 100,000 gallons in Tank 41 and, you know, 300,000 gallons, you know, that may change to 75,000 gallons of this one. So I think there may be a little bit of uncertainty there with the tanks that it comes from, but I would say that I don't see a huge uncertainty with the concentrations, the ending concentrations of the technetium.*

MS. PINKSTON: So out of those tanks where the waste might come from, have they been characterized yet, because the basis in the document for what -- for the concentrations chosen was basically, These are the ones that were assumed for the earlier batches.

MR. ROSENBERGER: Right.

MS. PINKSTON: And that assumption, in combination with the fact that the concentrations were lower than what had been seen made me wonder: Is there uncertainty in what these concentrations are, and have those later batches captured what the Tc could be?

MR. ROSENBERGER: Yes. And I'd say that some of the future batches are -- you'll see similar tanks, if you look at the batches that we made up about where it comes from, so it's not -- you know, you may take 100,000 gallons now and 100,000 gallons later. So some of those things that have been, I'll say, fairly well *characterized -- it's raining hard outside -- you know --*

MR. THOMAS: And I want to --

MR. ROSENBERGER: Go ahead.

MR. THOMAS: -- add to that, Karen. The material that we've laid out in track 4, you know, this is -- I'm trying to think of the right way to say this -- isn't new salt material. Some of it is a solution material that is well sampled and characterized. As Kent said, if there's any uncertainty, it's in exactly how we're going to combine those batches, but the material that's been selected for future batching through ARP/MCU that is laid out here, it's actually -- that's based on sample data, not, again, WCS, waste characterization system, projections and so again, I would say that --

DR. RIDGE: Specifically in that table, the first few seem to be based on characterization. You actually included references --

MR. THOMAS: Yes. Those are actually qualified salt --

MR. ROSENBERGER: Oh, yes. They're already --

MR. THOMAS: They've already been batched. This material currently in 50 -- and this material, which *is the feed tank to saltstone, there's material in Tank 49 which has been qualified -- what we call a qualified sample, qualified salt batch, where we've actually sampled that batch and well characterized it, and then as we were preparing the next salt batch, but we've already, again, combined the batch material. It's sitting in, I believe, Tank 22 -- Tank 23 -- or Tank 22, where we will then transfer that to 49 and then batch that through. So those are actually batched --*

DR. RIDGE: They're already physically mixed.

MR. THOMAS: Already physically made, those batches.

DR. RIDGE: Okay.

MR. THOMAS: And qualified. The future ones are based on sampling from the individual tanks that will be then defined into batches.

DR. RIDGE: Okay.

MR. THOMAS: So that's where there's a little uncertainty --

DR. RIDGE: So they are based on tank samples --

MR. ROSENBERGER: Yes.

MR. THOMAS: Yes.

DR. RIDGE: -- and then, you know, it's *simple mathematical averaging, and they haven't been physically mixed yet, but they're based on real measurements of what's in the tanks.*

MR. ROSENBERGER: That's correct.

MR. THOMAS: Correct.

DR. RIDGE: Thank you.

MR. THOMAS: And so in this case, the certainty is fairly low. Now, as we project out to SWPF where, you know, we're -- you know, those will become much more --

MR. ROSENBERGER: I mean, I'd say the near-term salt batches is -- like I said, we have pretty good characterization of the tanks that they're coming from. We've just been pulling pieces off of different tanks. If you ask me about salt batch 12, that's a whole different story.

DR. RIDGE: Right.

MR. ROSENBERGER: But the near-term batches, we have a fairly good idea of what's in all of those.

DR. RIDGE: Thank you.

MR. THOMAS: We have a good idea. I wouldn't characterize it as a fairly good idea. We have a --

MR. ROSENBERGER: Okay. We have a good

idea. Sorry.

MS. PINKSTON: My other question was related to salt waste to saltstone ratio. The saltstone was -- I said it the inverse way -- the saltstone to salt waste ratio. I looked at, just on a quarterly basis, what amount of salt waste goes to spillage; what amount of saltstone was created, which I know maybe doesn't -- it's averaging of our whole quarter. Maybe it doesn't see the whole picture.

But, you know, looking at the past, end of 2002 or so, it's been in the realm or higher or more conservative than what assumed in that report, but there were some dates way back in 2008 where it was a little bit lower, which would lead to higher inventory per FDC. I'm wondering what -- I guess there's two questions.

One, it was kind of interesting to me that earlier on in the process, there was a higher loading of salt waste to saltstone, because I would have thought maybe when things are just getting going, that it would be a lower loading, so I thought that was interesting.

Then my second question is: What do you know about the system to know that those earlier values, where it was a lower ratio, that that wouldn't apply?

MR. ROSENBERGER: I mean, I would say that over the past couple of years -- and Mark, you can help *me again if I misstate something here -- is that we've been optimizing the operation of the production facility, as far as finding, you know, the water to premix ratios that keeps the plant operating, you know, with reasonable expectation. And so I would say that the dilution -- or I call them dilution factors -- the grout to salt solution factors of the more recent operations is what we're looking and projecting that are anticipated as we move forward.*

MR. HAUER: In your question, are you already segmenting the difference between DDA and MCU/ARP, or did you combine that in your question?

MS. PINKSTON: Yes. I was just looking at the history of Saltstone that's been posted in the quarterly reports. What's the Saltstone production to salt waste ratio, and I just noticed earlier on that there was some values that were bounded by the assumptions, and --

MR. ROSENBERGER: That's correct.

MS. PINKSTON: -- I was just wanting to make sure that whatever caused that wasn't expected in the future.

MR. ROSENBERGER: No. Okay. We'll move on to the sensitivity analysis, and I would say that in the previous slide, we indicated a percentage between 18 *and 22 percent, and then we ran a sensitivity analysis using the updated stochastic model in deterministic mode, and we used the 22 percent, so we did use, for any of these runs that we're talking about here, we did use the upper end of that range that we talked about for technetium-99 inventory.*

We decided to go ahead and run cases K and K1 for information. We used the -- I say, the current Vault 1 and 4 inventories. That is current as of the March 2012 inventory document. That we're going to -- again, that will be something else we're going to talk about tomorrow, but again, using the revised methodology and the operations through current, so essentially it's where we are today as far as disclosing inventories within Vaults 1 and 4, and updated the projected 2, 3 and 5 technetium inventories, and we -- all other radionuclide assumption modeled inventories stayed the same as what we had in the RAI PA-8. So essentially for 2, 3 and 5 we only updated the technetium concentration.

And so, again, that was to evaluate the near-term disposal actions in Vaults 1, 4, and SDUs 2, 3 and 5. So I know this slide has a lot of information on it. This figure is in the technical report, so you can see from the perspective of -- similar to the earlier *slides where we had the lines talking about different periods of performance and different performance measures is that for -- and what we did here is we are showing both Sector I and Sector B, and I know that's some nomenclature for people that aren't familiar with the PA, but we evaluated the area around Saltstone into sectors so that we could evaluate concentrations and therefore doses around the disposal unit and be able to group for the sake of data presentation.*

I'll point out the significance of this is Section B is associated with downstream of Vault 4 so you see in the near terms higher doses associated with the Sector B, and Sector I is in the northern part of the disposal unit which is impacted only by the future -- primarily by the future disposal cells, and it's right in the corner, right where Disposal Units 3 and 5 sit, so it's right in that corner.

So we decided on these curves to -- these figures to present both the dose curves associated with Sector I and with Sector B. So if we look at disposal, again current inventories in Vaults 1 and 4 and projected inventories with the updated technetium inventories in 2, 3 and 5, you can see the doses associated with this, the timing. The peaks are out in that 13- to 16,000-year time period, depending on what sector you're looking at, *but in all cases, they're less than the 25 millirem performance objective.*

So that's for Case K. And then for Case K1, if you look at that, similar curve, similar information for Case K1. It's again Sector I and Sector B, and so you can see again these peaks are out in the 12,000 to 14,000-year time period, and you have one little spot right here. I think the dose is 26 millirem, 27 millirem, but essentially right at the performance objective for Sector B, and less than the performance objective for Sector I, but again, out well beyond the 10,000-year time period for Case K1.

MR. THOMAS: As we look at these two curves and the way the groundwater in the Saltstone facility flows, do you see any influence from 2, 3 and 5 into Sector B?

MR. ROSENBERGER: No. And I didn't provide a flow figure, but the flow direction from Units 2, 3 and 5 is kind of out into the northeast direction, and then goes -- when it gets down the further, then shoots off into the northwest direction. In the southern part around Vault 4, it tends to go off into that southeast direction, so you really don't see influences from 2, 3 and 5 to --

MR. THOMAS: So if we had zeroed out the *inventory at 2, 3 and 5, what you're saying is the curve --*

MR. ROSENBERGER: You'd see Sector I.

MR. THOMAS: Right. But Sector B, the curve there would probably see no change.

MR. ROSENBERGER: Correct.

MR. THOMAS: Okay.

MR. ALEXANDER: This is George Alexander. For -- I saw that you had some new groundwater wells around maybe 3 and 5.

MR. ROSENBERGER: Unit 2.

MR. ALEXANDER: Unit 2. Okay.

MR. ROSENBERGER: Yes.

MR. ALEXANDER: Will some of that hydraulic head information be incorporated in new groundwater modeling to verify some of the far field flow assumptions?

MR. ROSENBERGER: As we start to get data.

MR. ALEXANDER: Okay. I saw there were some new heads, but --

MR. ROSENBERGER: Yes. We had the potential to include that within that -- just like you did when we evaluated the available well data against the GSA database, and that will be additional data as it becomes available to evaluate against the existing well *data. And I think that was it.*

DR. RIDGE: Kent, this is Christianne Ridge. In this last discussion that you were going through, I think that the document that that relates to was some of the sensitivity analyses that were done that you submitted on July 12. There's a particular statement in the executive summary of this document that we saw pulled into some of the more recent submittals, and it -- we essentially were just wondering if you wanted to provide any comment on it, maybe now, or maybe you want to take it back and think about it.

But it didn't really match our expectation or our experience, and essentially what you're saying is that the -- you were less -- you think that the sensitivity analyses you did covered the -- let's see. I have it marked, and so I can just read it to you. But essentially what it says is that the sensitivity analysis you did covered our concern about the reconcentration in the floor, because anything that were to move the peak up with time would also tend to diminish it in magnitude.

And I can point you to that, but that didn't really match our experience when we looked -- when we did our own sensitivity analyses, and we put in a lower sorption coefficient in the floor. The magnitude of the peak increased dramatically. And I just want us to be *able to address it while we were still talking about this document, because if it is something that's going to be relied on, it's something we're going to need to understand a lot better what's meant by this statement.*

And even though I had it marked and George is now trying to point it out to me --

MR. ALEXANDER: If you want to keep looking, I don't want to stop you.

DR. RIDGE: You're on page --

MR. ALEXANDER: Well, this is a different document. This is the same --

DR. RIDGE: This is a different document. Yes. Let's see. I want to stick with the one that Kent was just talking about, just to be fair. Okay. This is where I am. I'm on page 5 of the sensitivity analysis document that I think you were just talking about which is the SRR CWDA 2012-00103, which does not help anyone sitting over there. I apologize.

But essentially it says, "In addition, although the NRC has questions about modeling parameters, for Case K and Case K1 in their technical evaluation report, specifically related to the treatment of technetium retention in the disposal cell floors, any changes that lead to an earlier peak dose timing from technetium would tend to decrease the magnitude of such *peak."*

And this was a sentiment we had seen pulled forward into the later July submittals, and in fact, at that point --

MS. ROSS: In the July 26 submittal?

DR. RIDGE: Yes. The July 26 submittal. And at that point, I think, it even specifically mentions fracturing in the disposal unit floors, but that's -- we were wondering if you wanted to comment on that, and I'm putting you on the spot now by pulling out this very specific thing, and I don't mean to do that.

But as far as addressing our concern about retention in the disposal unit floor, this document that you were just talking about sort of says that it addresses that in this way, and we didn't see this as really answering the concern, so I just wanted to point that out to you. And, you know, I understand that I'm putting you on the spot here, so it might not be the right time to respond.

MR. ROSENBERGER: Yes. And I think it was mainly -- and I'd have to go back and --

DR. RIDGE: Yes. Obviously.

MR. ROSENBERGER: -- talk to them and -- yes. We'll have to think about that.

DR. RIDGE: Sure.

MR. ROSENBERGER: I'll just have to say we'll have to think about that at this point.

DR. RIDGE: Sure. And then that's perfectly fair, and I don't mean to put you on the spot, but if we are going to talk about this --

MR. ROSENBERGER: Sure.

DR. RIDGE: -- document, that was one of our --

MR. ROSENBERGER: That's fine.

DR. RIDGE: -- main take-aways from this document was that we needed to run that one down.

MR. ROSENBERGER: Okay. I hope we can talk about that in the next --

DR. RIDGE: Yes.

MR. ROSENBERGER: -- couple days.

DR. RIDGE: But it's in the earlier one, too. I'm not just jumping ahead.

MR. ROSENBERGER: It is.

DR. RIDGE: But part of the reason -- this is in the July 12 submittal that we are talking about. It's the --

MR. ROSENBERGER: Correct.

DR. RIDGE: It's the document Kent was just talking about.

MR. ROSENBERGER: That's correct. Okay.

MS. ROSS: I guess specifically -- let me clarify, Christianne. Predominantly whether the floor is fractured and so you don't get the hold-up in the floor relates to the timing of the peak.

DR. RIDGE: No. It also relates to --

MS. ROSS: I mean, I understand --

DR. RIDGE: -- the magnitude.

MS. ROSS: Yes. But if you ignored that, the reason -- because we did the exponential growth, we did a really strong release in technetium.

DR. RIDGE: Right.

MS. ROSS: At one time.

DR. RIDGE: Uh-huh.

MS. ROSS: If you had growth inward -- I mean, if you had a different growth rate of fractures, where you had earlier fracturing, it tends to lower the magnitude. It would slow the release.

DR. RIDGE: If it were more gradual.

MS. ROSS: More gradual.

DR. RIDGE: If it were more gradual, yes. If you merely went in and took out the hold-up in the floor, you get a much larger number.

MS. ROSS: Right, right, right.

DR. RIDGE: But, yes. If you had a more -- if you had more gradual fracturing, certainly it *would make it an earlier peak, and it would reduce it, but it's not globally true that anything that moves it forward in time reduces the magnitude, and specifically this document put that specifically in terms of addressing our concern about the hold-up in the floor, and that's what we need to have some more discussion about, because I don't think it addresses our concern there, but I do agree with you absolutely that if there were more gradual fracturing, it would move it earlier, and it would reduce the peak.*

MS. ROSS: Right, right.

MR. ROSENBERGER: Okay. Got that.

MR. DEVASER: In the meantime, any questions?

(No response.)

MR. DEVASER: All right. Oh, does anyone on the phone have a question?

(No response.)

MR. DEVASER: Well, interrupt me if you do. Tomorrow, there was some talk about tomorrow and the next day, our on-site observation that we're going to be conducting at the Saltstone facility. Following any of those observations, we publish a summary report of the details of the observation within 60 days afterwards.

Also, any of the documents that were

referred to in the presentations, to my knowledge -- I hope I'm not forgetting one that is not, but to my knowledge, all of them are publicly available and are in our ADAMS system on our public website, so if you want any information about that, just get ahold of me and let me know.

Also, as this is an NRC public meeting, we'll be preparing a public meeting summary within 30 days of today, and the summary will be supplemented by the transcript that the very friendly court reporter has put together today. So if there's no other questions or --

(No response.)

MR. DEVASER: Thank you.

(Whereupon, at 3:50 p.m., the public meeting was concluded.)