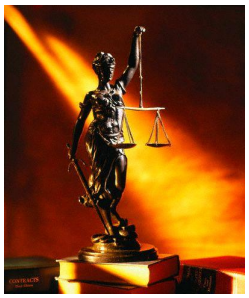
# PROPOSED CLEANUP ACTIONS FOR REMEDIATION OF HANFORD WASTE SITES CONTAMINATED WITH PLUTONIUM AND CESIUM



**Tuesday, July 19, 2011**
**Richland, Washington**

**Tuesday, July 19, 2011**

**Richland, Washington**

BE IT REMEMBERED THAT, pursuant to the Washington Rules of Civil Procedure, the Public Hearing was taken before Kathleen McKee, a Certified Shorthand Reporter, #3115, and a Notary Public for the State of Washington, on July 19, 2011 commencing at the hour of 6:28 p.m., the proceedings being reported at Richland Public Library, 955 Northgate Drive, Richland, Washington.

**PUBLIC HEARING**

**TUESDAY, JULY 19, 2011**

**6:28 P.M.**

**MS. SHOEMAKE:** If I can have everybody go ahead and have a seat we're going to start the actual public meeting that we're here for tonight. We are here to talk about the proposed plan for cleanup of the contaminated waste sites in the Central Plateau. If you're not here for that meeting you're on the wrong flight so you'll want to exit left and find your other meeting. So tonight, let's see, we are going to go through a couple of things here.

This is the agenda over here. You just hopefully had some time to look at the posters in the back and ask some questions and have some dialogue already during the open house. I'm welcoming you right now so welcome to the meeting. We're also going to have representatives from the Department of Energy and EPA give an overview of the plan. We'll have a local perspective. We'll do a Q and A session. It's set on here for about 20 minutes. We can make that last as, you know, a little bit longer if we need to. That's your opportunity to ask the questions that you have. If you have any clarifying-type questions that you'd like to discuss we have a full room of experts here. You've definitely got a captive audience so that's really your

opportunity to do that.

Then we have the formal public comment phase of the meeting. And we have a court reporter sitting right over here that is actually transcribing everything that we're saying here at that meeting. But the formal comment period will be I actually will give you the microphone and your comment will be recorded verbatim into the record. And so we would really like to get as much of the Q and A out of the way during that section and leave the last section for the actual formal public comment.

Out on the table out here there's several handouts. There's a facts sheet that gives you kind of a good overview of the plan and what's in it. There's also available I'm told, Sonya, that there are some DVDs available of the proposed plan, the fact sheet as well as a couple of other documents. So if that's something you're interested in you can see someone at the front table for that. Your opportunity for public comments tonight is not just here at this meeting. If you saw on the back of your agenda there's actually a comment sheet on the back of that, pretty brilliant I might add. Nice job. You can actually write your comment on that and turn that in tonight. You can also do it by fax or e-mail or on the website. So there are plenty opportunities. There are also a couple of other public meetings coming up. Thursday there will be one at

the Seattle Center. Next Tuesday there's one in Hood River. And Wednesday there's one at Portland State University. So it is a 30-day public comment period with the comment period ending on July -- sorry, August 5th. So that's what I have to kick off the meeting. And I think right now I'll see if I can get this mic off and I'll turn it over to J.D. Dowell with the Department of Energy.

**MR. DOWELL:** I would like to echo Joy's welcome tonight. Thank you for taking the time out of your busy schedules to come here and listen to this public hearing on PW-1, 3, 6 and CW-5. Before we do this I'd like to do a quick introduction of the team from Department of Energy as well as our contractors that are here to support tonight. And we'll have a question and answer period later but we'll also have time after the presentations to actually talk with them. So we're just going to go around very quickly and I'll have them introduce. Greg, why don't you start?

**MR. SINTON:** I'm Greg Sinton with DOE. I'm the project manager for the CW-5.

**MR. CHARTA:** Bryant Charta, federal project manager for soil and ground water.

**MS. TORTOSA:** Arlene Tortosa. I'm the project lead.

**MR. DOWELL:** And CH-2?

**MR. JARAYSI:** I'm Moses Jaraysi. I manage the

environmental program for CHS.

**MR. MCKINNEY:** Dale McKinney with the CHPRC environmental programs also.

**MS. ROHAY:** I'm Virginia Rohay. I'm one of the technical support.

**MR. DOWELL:** Okay. Earlier tonight also as you were coming in or if you were here for awhile looking at the placards in the back we had the Hanford story running. We also showed a number of slides that showed the progress that's being made on the site. We're going to do that as part of our continued outreach. Anytime we have a chance with the public to show what we're doing out there I think a picture tells a thousand words so it's a good opportunity for you to see what's going on out there. It's not designed to soften you up. It's just basically to make sure that you understand that there is progress being made and there's some really excellent work being done out there so it's an excellent chance to do that.

So the purpose tonight is really to get your input, to give you what we think our best plan is, our preferred alternative is what we call it, for this cleanup and remediation work and to get your input. I'm going to start -- as you see the agenda I'm going to start with a brief overview on the Hanford cleanup approach. And I know many of you work and see this all the time. I just don't

know how many other people have not so bear with me because it's got to go through a stage process so everyone has the same level of understanding for this brief. There's 22 slides in the brief. I'll spend about a minute on each slide is my goal. So that's the big picture. And then we'll get actually into the applicable units and the background, the remedial activities, and the preferred alternatives in each one of those. And as Joy also discussed lastly how you can provide input. So that's the most important part of this reach-out tonight is making sure that you understand how you can give us your input and that it's valued. So hopefully you'll be able to give that for us.

So from a cleanup approach perspective the Department of Energy has two documents that I think are very important. I'm the manager of the Central Plateau. I haven't been there too long but these are two documents that I refer to quite often. These are Department of Energy documents. They're not EPA documents or Ecology documents. They're guidelines for how we do our strategy. And the first one is the one you see here. It's the Hanford Site cleanup completion framework, this document right here. And it provides exactly what you see here, an overview of the Hanford site as well as the goals for cleanup, some of the challenges we face in that cleanup, and the relationships

between the different areas that we are trying to remediate.

The second one also available to the public is the Central Plateau cleanup completion strategy. This goes a step level further than that overall arching framework and is a subset of that if you will but has excellent background and details. Highly regarded read for you-all to get a good understanding of how we see this cleanup strategy going at Department of Energy. Just another note, too. This document costs us $65 apiece to copy so I'd like to hand one out to everybody but we have it on a website link and I would prefer if you go electronically to get that. We're trying to do the right thing from that perspective. Next please.

So in looking at the Hanford cleanup footprint, again I'm going to kind of drill you down. So think of this as the big picture macroscopic, which it is. 586 square mile Hanford Reach National Monument area in green. The River Corridor is another area we're going to remediate. We're doing this by areas, is in yellow. And then the Central Plateau is this brown area with two parts to it, the outer area and the inner area. There's about 290 square miles with the Hanford Reach National Monument, 220 with the River Corridor. And then Central Plateau is a total of 75 with the inner area making up 10.

As I think of cleanup here I get an intuitive

thought about how we're trying to mac down into this inner area as we conduct our cleanup and the idea of course is to protect the Columbia River, our primary concern. So as we remediate these areas we're shrinking. National Monument this year, River Corridor by 2015, much of the outer area by 2015, and then trying to consolidate into that inner area. And that's the theme for our strategy big picture. Next please.

Within the Central Plateau as you break this area out it's broken down into three focus areas. And basically when we look at these area this is what the strategy document that I use really breaks down our effort. And the effort is broken into groundwater, the outer area, and then the inner area, three very distinct areas. The groundwater, again trying to remediate and pump and treat as much of the known contaminants that are in the soil that are reaching the soil and reaching the groundwater as we can and targeting plumes with specific equipment to try and remediate anything that gets into the groundwater. And we're also trying to bring the standards from the outer area basically to the same standards as the River Corridor which is try and reach drinking water standards with groundwater in the outer area. And if we can't reach drinking water standards by all means prevent plumes from getting into the groundwater and getting to the river. On the inner area I'm

going to talk about that next so I'll save that for then. Next please.

So when we look at the inner area and we look at this graph or this graphic you can see that there's been an interim development of different remediation strategy -- remediation strategies that have taken us through decisions or recommendations that bring us here today. You know, when I think of an inner area I think of a geometry if someone were just trying to just target an area and develop it, you know, normally you do it by geographic rivers or natural lines of demarcation. But you can see here that in trying to define this inner area to as small as possible we are defining the footprint by the decisions we're making on these remediation strategies.

So as you see us go through 1965 when Ecology set up a low-level radioactive waste disposal site right here, nuclear reactor, parts disposal, and et cetera as we went through all these decisions and some recommendations the site began to take shape. And instead of just filling this in and calling it let's make it that we are actually trying to segregate where those bad areas are in those inner areas where the government is going to be there. Our presence is going to be there until further -- you know, for a long time. We're there for a long time. We're custodians of this material. We're custodians of these areas for as long

as it takes us to maintain human health and public safety and safety to the environment. Next slide.

So for Hanford's cleanup footprint when you look at the interim approach it's framed by keeping that inner area to as small a footprint as possible which is ten square miles. That's what we estimate that that area that you saw before this is going to be. We also have a commitment for that long-term management remaining in DOE control. That area is going to remain in DOE control. I'll just leave it at that. We can talk about that later I'm sure.

Then when you go through the inner area approach you can see that our commitment is to make comprehensive and consistent risk-based decisions. So we're going to basically evaluate these areas using the nine CERCLA criteria. And Greg, could you bring that up front please for me and just put it maybe off to that side. I want people to be able to see that as we talk.

We're going to shrink the waste disposal and residual contaminations protective of human health and the environment. CERC words, LA. Human health and environment, that's what we're here to protect. That is our commitment as the custodians of this area long term. And then throughout the time I see, you know, right now that as we make decisions here and start our remediation process for these areas it doesn't stop there. Number one, we have a

commitment by CERCLA to give out five-year reviews for reevaluating the effectiveness of all the measures that we take for remediation. Number two, the exciting part to me is that we're here long-term custodians. If there's other technologies that come up in the future and we evaluate that we're not effective in what we've done we'll be able to leverage other technologies in the future that are probably more cost-effective than what we have today to again try and remediate this to ensure human health and the environment. Next slide.

So from a CERCLA process standpoint these are the six steps for the CERCLA process. And on that placard right there is the CERCLA evaluation criteria. So as we talk about the preferred alternatives I'll talk more to this. But right now as you look at this process you can see where we're at today. You see the "we are here" sign. To get there we actually did site inspections. We did the thorough assessment, the background work to determine what was done with these areas. We looked at historic precedent. We looked at, you know, all the history and everything that was documented on all these sites. The process documentation of the flow paths through the PFP and the Z plant and Purex plants. And then we -- and then we did all that data evaluation. We looked at all the samples that have been taken. And we started the remedial investigation. Again,

that kind of fed into the remedial investigation and feasibility study where we took all that data, did a feasibility study which evaluated the risk facing that material, determined whether we had enough information to actually go to a decision, and then started to develop the alternatives that we started to present to the public basically two years ago in 2009 and 2008 and 2009 and started to receive input on those back then.

For managed input we developed a proposed plan so of all the alternatives we looked at. And some of those are dictated by CERCLA for us to look at those. We came up with the actual documented preferred path. And that's what we're here to look at tonight. So we've identified the preferred alternative. We're in the process now for public solicitation of comments and that's what we're here to do tonight. After that we'll take it back to the EPA and Ecology. We'll compare notes. We'll determine whether we need to make changes. We'll tune our alternatives and then make the decision. That's done in a tri-party agreement. And then we go to the record of decision that we all sign and commence the remedial action. And then get into that five-year review process with CERCLA as I talked about under a long-term custodial strategy. Next please.

So this actually starts where we get into the actual operating units and talking about the actual

remediation strategy. So here's the meat. The previous part was the potatoes. This shows you the four sites that we're talking about. 200-CW-5, 200-PW-1 and 6 are over on the west area of the inner area. And 200-PW-3 operating unit is over on the west -- or east side of 200 east and the inner area. We're going to drill down like I said so next slide.

And I don't necessarily need to take too much time with these but again, this slide is good because even though it's color-coded and you can't read that you can see all the things that make up that definition of that inner area form. We call it a soup bowl. I don't know what Ecology or EPA calls it but we call it a soup bowl. That's what we've been taking about earlier. But it does have that look to it. And you see disposal areas in brown, dark brown. You'll see tank farms in green. You can see the geometry has been defined by those decisions and previous decisions made for remediation areas that are actually defined in this boundary. So again, try and keep that footprint as small as possible. You know, it's not the best one in terms of efficiencies for getting to and from a place but it does make it so that it's the smallest footprint possible.

We're going to be talking about these red areas basically. That's the areas where CW-5 in that red circle there. And PW-1 and 6. And then PW-3 is on this side over

here in the west area. Next slide please.

So getting into the term west area you can see some of these areas and they're kind of hard to see. They're on the placards in back so hopefully you had a chance to take a look at those. But what we're talking about when we look at these areas are a lot of trenches, a lot of different types of drainage systems, engineered systems for getting waste readily into the ground from the plutonium finishing plant and Z plant which we're located here and here.

So as you break down these areas, these various sites, I'm not going to go through them and show you which ones are part of CW-5, PW-6 and PW-1 because we'll get into that here in a second. But this gives you a physical layout of how these things were arranged around the plants. And of course they're in proximity to these plants because they were used for dumping the waste or dumping the steam condensate from the cooling process.

So when we look at this when we talked about specific areas in detail there is a color code to this. Again, I think it's more efficient if you see it. If you want to see it in detail that you go in back and look at the placard after the brief. Next slide.

So this slide shows 200 East area. 200 East was predominately -- clearly that's on the other side of the

inner area. Purex is the source for the sites in this area. And again, we're going to be getting -- kind of drilling down into these so we'll talk about the specific constituents, risks, the analysis as we get to those. Next slide please.

This kind of gives you a general view of the idea of how each of these sites were processed, how the waste was disposed. You can see it down here. Cribs, pile fields, trenches, tanks, cribs, and file fields. Most of the cribs and the tanks if you think of a septic system, a pipe running into a tank and then distributing into the ground and maybe having a gravel bed underneath it, that's the kind of tank to think of when you think of a crib or a tank. For a ditch it can be anything from a straight dirt ditch where they just let the effluent flow out. Or it could be an engineered ditch where they actually either laid concrete or laid some kind of pathway into a gravel bed with an engineered pipe called a French drain when you have pipes with holes drilled in them so it more evenly and officially distributes that water into the ground. That's what it was all about back then and this kind of shows you exactly where those processes were done in each of these areas. Next please.

So for this 200-CW-5 operable unit it basically had three shallow open ditches. These were known as Z

ditches. These were really, really long ditches, 4200 feet long. And I think I've got that right. 4200 feet on Z ditches. There was one tile field and one unplanned release site. So these are very long ditches. These are very kind of low technology ditches. They were dirt. Some of them had some of the drainage that I talked about but mostly very low tech. They received cooling water and steam condensate from the plutonium finishing plant, the Z plant. And their contamination was located primarily at and below the bottom of the trenches, so very shallow. It was a very shallow contamination field. In fact most of those fields when you look at the engineered part of it the rock is about two meters deep, about six feet deep. And it's kind of hung right in that general facility. It got into the ground and right underneath that if at all. Very few of them exceed 15 feet.

The primary risk factors here were americium-241, plutonium-239, cesium-137 and radium-226. As we went into the remedial alternatives we looked at the no action alternative, which again is required for us to look at. We looked at maintaining the existing soil cover, and institutional controls. We looked at remove, treat, and dispose. I think these are all -- if these aren't understandable raise your hand. We looked at engineered surface barriers. An engineered surface barrier would

simply be a way of engineering a barrier on top so that water can't penetrate into that field and drive, as a motivating force drive that contamination further down. So that would be an engineered surface barrier.

We looked at in situ vitrification which I think is a fairly sophisticated way of glassifying the ground by placing electrodes on four corners in the area to be vitrified, putting an electrical charge through it, and then actually glassifying the material in place to hold it where it's at. And then we looked at a combination of alternatives. In looking at the final alternative we did a remove, treat, and dispose. So the objective here is to remove the contaminated soil up to approximately 15 feet below the surface of the structure, treat it as necessary, and then dispose as required. Let's see. When we look at that, you know, one of the things that -- if you can go back just real quick. This kind of fits into this process right here because this is the first one we're talking about. When we look at the balancing criteria we're looking at the long-term effectiveness, the short-term effectiveness, the cost-effectiveness, the implementability, that is how achievable, how successful you'll be in going down that path of remediation. And then how well it's going to reduce the toxicity. You know, clearly the driver is going to be human health and environment safety. But we look at all these

things to make sure that we're selecting the best alternative. And the way DOE does this is we put it into a matrix and we compare those things out. So when we go through the selection process sometimes it's very apparent, you know, what you're supposed to do. Sometimes there's a lot of, you know, evaluation that needs to be done. You have to dig deeper to see if there's more information and sometimes make decisions based on what you have. For all of these operating units tonight we have enough information to make those decisions. So we wouldn't be here, we wouldn't be talking to you unless we felt we had the right and the solid amount of information to make that decision to protect health -- human health and the environment. So looking at 200-PW-1, 3, and 6 operable units these are 1600 ground engineered sites. And when we talked about engineered sites these are just sites that were designed to place this stuff into the ground quickly. They're organized into five waste groups and this is important because the decisions are broken out by these waste groups. There's a high-salt waste group. There's a low-salt waste group. There's settling tanks. There's cesium-137 and there's other sites. And all those things aren't the same category. Cesium-137 is not like a settling tank. A settling tank is a geographic configuration of how it was disposed whereas cesium is a constituent. High salt and low salt are two forms of aqueous

plutonium and non-aqueous plutonium that -- and americium that are evaluated separately because they had different penetration depths as we were evaluating them and they went through the soil. So it gets a little complicated but not too complicated. Just stay above it and as we go through it I think it will become more intuitive for you. The primary risk drivers -- I'm sorry, the Hanford site operations were from disposal of plutonium to waste water. Predominately for PW-1 and 6 it was PFP and Z plant. Z plant was the old plutonium finishing plant. And then in PW-3 it was Purex, plutonium uranium refraction and--

**AUDIENCE MEMBER:** Plutonium uranium extraction facility.

**MR. DOWELL:** Extraction facility. Thank you. Thank you. The primary risk factor for plutonium-239 through 40 americium and carbon tetrachloride. Carbon tetrachloride is important. We'll talk about it later because it was a mechanism for driving some of the plutonium into the ground. And of course I talked about the cesium-137 and PW-3. Next slide please.

So looking at the alternatives the only difference between this and the previous slide is two-fold. Number one, we have no actual alternative but we have a maintain or enhance existing soil cover with this acronym. Again we have engineered surface barriers. We have in situ

vitrification. Remove, treat, and dispose. And soil vapor extraction. Soil vapor extraction is a means that we go to get carbon tetrochloride by pumping air into the ground, basically desiccating it and pulling it out as we try and recover that material because it's highly volatile. It goes into a vapor very quickly and it's very effective in extracting that material. Next slide please.

So looking at the high-salt waste group predominantly in PW-1 we know more about this than any others because 216 Z-9 is the area that we've really studied very hard for a long time. PNNL has done studies on it. In fact as we look at plutonium mobility I've got two examples of studies that were recently conducted in 2008 by PNNL looking at plutonium mobility in these area in both PW-1, 3, and 6 as well as specifically for Z-9. Z-9 I think we have the most amount of data on to really base this decision.

And what we can see there is, you know where our alternative is focused on continuing to operate the soil evaporation system or the soil vapor extraction system. We're going to excavate the highest concentration contaminated soil and dispose as required. We're basically going to take two feet of the material underneath the structure and recover that material and dispose of it as required. We're going to have to remove and dispose of all the associated structures which is basically the structure.

If you look at this tank, it's not a tank but if you look at it it's got a physical structure about it. It's got a cement cap on the top of it. It's actually got stairs that lead down into it and a viewing window. It's a very extravagant site and of course it's one of the sites that are like that. But there's a lot of structure that we're going to remove for that. And then we'll backfill with the evacuated area of clean soil and then construct an evapotranspiration barrier on top. The evapotranspiration barrier is very similar to an engineered cap in that it's designed to evaporate water by various layers of sediment and different kinds of materials along with some sheeting to ensure that the water doesn't get to the source and drive it down further. Next please.

For the preferred alternatives for the low-salt waste group we're going to remove significant portions of the contamination and dispose of parts. So basically R2d and an evapotranspiration barrier. And we're going to get most of the material, a significant amount of material. We're taking basically 15 feet of the low-salt waste group and then we're going to put that transpiration barrier on top of it and that will be the solution for that.

For 200-PW-3, the cesium-137 waste group, there's no significant plutonium in this area right now. So when you look at that cesium-137 is the driver for the decision.

Cesium-137 had a half-life of about 30 years. Our solution for this is to maintain and enhance the existing soil cover. Some of this material is already covered by 15 feet. It's in an area of a lot of other material, a lot of other remediation sites that are going to require similar types of decisions in the future. So at this point our choice is to ensure that the waste sites are at least 15 feet below the ground. And again, a reminder. This is in the inner area. We're there long term. We're going to be watching this material. We're going to have institutional controls that prevent people from working on or using the water from or doing other things that we'll be able to do in the Central Plateau outer area and River Corridor that we will not be able to do inside the inner area of the Central Plateau. Next slide.

And I'm almost there, all right? Slide 21. Slide 22 is coming. We're almost done. Everybody wake up. On the waste group we have I think two settlement tanks. We're going to basically remove the sludge, the liquid from those tanks. We're going to process that appropriately. It's going to be remediated appropriately. We'll dispose of it as required.

What that means is that it's either going to go to WTP or it's going to go to ERDF. I don't want to play around with what that means because, you know, we talked

about this material and everybody wants all the plutonium to go to WTP, right? Everyone wants that. But we're going to dispose of it according to what we find and how we dispose of it. I mean, that's just the facts of what we can do and what we're planning. And then we're going to grout those tanks in place.

Lastly on 200-PW-6 which is another site waste groups there's no action required. This is a French drain in Z-8 and an injection reversal well on Z-10 where the concentrations are below the risk range and therefore don't require remediation.

Last slide is the get off the stage slide. It's basically a continuation of what Joy left and emphasized so well and that is that the public comment period will end on August 5th. You can provide the verbal comments here. There's a web site -- or not a web site but an e-mail address right there you can provide comments at. We want your comments. It made a difference in the decisions we made to get here. We could have taken Z-9 and capped it. And we didn't do that. We're actually going for some of that material. We're going to extract some of that material. That's not what you necessarily call a pure risk-based decision depending on who you talk to. But at the same time it was the right thing to do. We listened to what you had to say about that so your comments matter and it's

very important that we get them. Like I said the tri- party agencies consider all the comments and then we expect to have a record decision by the end of September. Thank you and I'll put Emmie on stage.

**MS. LAIJA:** Hello everyone. My name is Emmie Laija and I work in the Environmental Protection Agency. I'd like to take a second just to introduce some of my coworkers. Craig, did you want to introduce yourself?

**MR. CAMERON:** I am Craig Cameron. I'm the project manager for the CW-5 file program.

**MS. LAIJA:** And this is Dennis Faulk. He heads the Hanford project office located here in Richland. So I just wanted to take a second again to thank everyone for coming out. Public involvement is very important. As J. D. had mentioned it makes a difference. It makes a difference in the decision we take when cleaning up the Hanford site so not only your attendance here but any comments you might submit will be looked over and they will have impact or influence on the decisions we're going to make.

For EPA our main mission is to continue in helping the environment. In looking at these preferred alternatives that have been identified here tonight we do find them to be protective. So I'll put that out there. But we are particularly interested in how the public feels about the preferred alternative for the cesium sites. The preferred

alternative was to maintain or enhance the existing soil cover by having a 15-foot depth. That's a unique approach. It's something new for EPA so we are potentially interested in hearing what you have to say about that but we're interested across the board in hearing what you have to say on any of these preferred alternatives or just to clarify any questions you may have as well. I think that's all.

**MS. SHOEMAKE:** All right. Thanks J. D. and Emmie for that. I appreciate that. Before we go any further I also wanted to recognize John Price is here in the audience from Ecology. And so John will be available too if you'd like to ask him any questions later. So now let's turn this over to Susan Leckbank who is the chair of the HAV.

**MS. LECKBAND:** I only have 84 slides. No, zero slides. Thank you very much. I would like everybody who is a member of the Hanford Advisory Board to raise your hand please. Great. We've got great participation tonight. Thank you very much.

For those of you who aren't familiar with the Hanford Advisory Board it is a citizen's regional advisory board that provides advice to the Department of Energy, the Environmental Protection Agency, and the Washington Department of Ecology. It's made up of 31 seats representing a very diverse group of interests as well as some individuals from the public. So we provide consensus

advice.

Let me give you an image. Every one of you has to pick what you're going to eat for dinner and you all have to agree on what it is. That's what our board does. We look over the technical issues and determine how we can be most effective in providing advice to the agencies in the consensus process. Not particularly easy.

The board has been following these waste sites ever since I've been on the board. We're very concerned about them. One of the basic values of the HAV is protection of the Columbia River. In order to protect the river the groundwater that flows into the river must be protected and remediated if contaminated. Contamination reaches the ground water that flows under the Hanford site to the river from many different sources, some of which are these waste sites. There is a very big potential for that.

We're concerned about the many miles of trenches containing varying levels of plutonium and cesium and other wastes that are not planned for retrieval. Plutonium is forever. The board feels and understands that. We're not particularly convinced that watching and putting caps on will be protective over the long haul. This is a long, long time.

The message in the Hanford Advisory Board Advice 247 -- and I don't know how many of you notice that there is

copies of the advice out there and I would suggest that you visit the Hanford Advisory Board website, www.hanford.gov. Look at the advice that we've given over time. And there are two particular pieces of advice specific to this proposed plan. We advised DOE to get as much plutonium as possible out of the waste sites that we're discussing tonight. Not diluting it with fresh soil. Get it out surgically if you have to and get it off the site into a deep geological repository where it would be positively protective of human health and the environment.

They have also advised that remedial design for cleaning up technetium and nitrates in waste sites be based on increased characterization and sampling in order to get the right numbers and the right data to determine what you need to do. The DOE will -- that will enable DOT to determine the location and the extent of the contamination so they can remediate as they go. We're not suggesting they stop doing remediation but do these activities in parallel as they're cleaning up these waste sites. We also advised the agencies to hold public meetings and this is evidence that they accepted our advice and we're very grateful for that.

The Hanford Advisory Board provided the tri-party agencies with two flowcharts and I've got copies of those out there as well. One of them is the Central Plateau

Remedial Actions flowchart. Our default is always retreat, treat -- retreat, treat, and dispose if practicable and if possible. We stand by that and it's been a tenant of the advisory board for more than 15 years. And this flowchart helps the agencies look at where there are decision points. And I would recommend that you take one of those if you're interested.

We also provided them with the groundwater values flowchart. And we're very grateful that the agencies do look at these charts and I've seen them actually tacked up on walls in agency offices so I do know that they are paying attention to those things.

We simply aren't convinced that a cap over a waste site will stand up for one hundred to thousands of years. We're just not convinced that that's the very best alternative for some of these waste sites. Strategic, even surgical removal of those long-lived radionuclide contaminates from these waste sites for disposal in deep geological repository is a safer option. That's it. Thank you.

**MS. SHOEMAKE:** Very good, very good. Thank you, Susan. Okay. So as the facilitator this is the exciting part of the meeting for me. So we're going to move into our question-and-answer period. And so what I'm going to do is just kind of open it up for anyone who has a question.

Again, I'll remind you that we do have just a roomful of experts here so we are open to any question. So who would like to start? In the very back. Let me see if I can get the mic.

**MR. ENGSTROM:** Of course it's in the back. I've got a voice that can kind of project forward.

I'm Dale Engstrom and I'm from Oregon. My question is this. The proposed plan, first of all let me congratulate DOE. There was a time when the entire plan was to put caps over everything and that was a really bad idea as Susan Leckband was saying. That was incredibly awful. But now the plan is they're going to dig up around two feet from the bottom of the worst two trenches, the high-salt disposal areas. And that two feet is predicted to get somewhere around 48 to 50 percent of the contaminant, the plutonium mass that's sitting in the bottom of the trench. But the point is if you're going to be already lifting out the fill dirt that was already on top of it and going down two feet then my question is has there been any thought about going five feet deeper and getting more of that contaminant mass while you're there?

**MR. DOWELL:** I think I can answer. And the answer is well, there's two slides I want to bring up here that kind of talks us through the decision-making process for that. And I'll start with the first slide which is slide

30. If you just type in 30 it should come up. That one.

So when you look specifically at -- and this isn't Z-1A tile field but this is a good example of what areas we're talking about it. When we look at the two-foot depth that we're treating to we are not trying to mitigate the risk of that material from a standpoint of capturing as much plutonium out of the ground as possible. Again, going back to the decisions made in balancing criteria when you look at a reduction of toxicity of that material you look at the example of that placard back there at Z-9 where we think that material is staying. I call it stable. Not immobile, it's stable.

When we do the EIS analysis and modeling for that material in the current tank closure and waste management EIS, when I compare the modeling to that to the modeling that we've done in other areas that material is staying where it's at relatively for 10,000 years. It's not moving according to our current analysis. That said, there are -- and I know Oregon, I know you guys have done a lot of homework on this and Dirk is out there bringing that up and I appreciate that. I think it's good to challenge us on this. And that is is plutonium mobile. That's what it comes down to, is plutonium mobile. Is plutonium going to get into the water column. And the answer that we have at DOE is no. We don't think it's going to get there.

So when we look at the knee curve and we look at the effectiveness ratio and we look at the additional cost. And you know, I'm talking about costs at risk because I know you-all think that we just think of cost all the time and that drives our decisions. It's not. It's the balanced decision approach but we have to consider costs in our current environment. We have to consider the best bang for the dollar in remediating these sites. And in doing that you know you evaluate the reduction of toxicity versus the cost. And since this material is already, you're looking at 18 feet at the bottom -- 18 feet at the bottom of the thing and then 20 feet is what you're talking about at 51 percent. And these are all relative, right? I mean, we're probably within some statistical analysis difference here.

We can go -- we looked at going to four different areas. We looked at doing nothing. We looked at two feet. We looked at roughly 18 feet. And we looked at something greater than that and maybe Arlene can help me with that. We were trying to figure it out before this. I think it's 36 feet, it might be deeper than that. It gets extremely more expensive and you can see the constituency of plutonium as we go to depth. If you want to capture 99 percent you've got to go to 64 feet. You want to capture 96 it's 36b feet. 90 percent it's 26 feet. Some of you would say I'm a project manager, right? I go to the curve of the knee.

That's going to be the place where optimization is made on this. Not so when you look at it from a balancing case. I think that's settled. We're here. We're not going there. And the reason is because for us to do anymore than what we're taking out of there and capturing 50 percent it's not changing the reduction of that risk in general to human health and the environment. So we're not making a significant impact at additional cost to making any kind of change to protecting you or the environment. That's what I'm saying.

So, you know, we get through that decision process. Is it optimized? We think it's optimized but we did look at it. And I'll bring up the next slide and that is I talked to you about how we did waste decisions. Please bring up slide 27. And when you look at the matrix for this -- I'm sorry, it's not the right one. Go -- I'm sorry, 28 maybe. Go back to 26. Oh, sure. I'm sorry. I was on the right one.

So when we looked at these options, option A, follow me here for a little while. This is a two-fold option. This is the no action option, remove the structure. This is -- or actually I'm not sure if I said that right. Is that structure or is that just cap?

**MS. TORTOSA:** It's not a no action. Option B is 15 feet but two of the waste sites have a void space where

it really doesn't fly. Two of the waste (inaudible) 13 feet. We would be backfilling. The other two with the void and putting a cap on the site.

**MR. DOWELL:** Yeah. Arlene, why don't you point to that placard. When you say void space I got confused when you say void space but it's basically the existing structure is a void space.

**MS. TORTOSA:** Well, right. There's nothing underneath. Like Z-9. That is with a cement cap over it.

**MS. SHOEMAKE:** Can everyone hear Arlene? I'm sorry. You just have such a nice voice I'm guessing folks can't hear you. Sorry to do this to you.

**MS. TORTOSA:** Can you hear me now?

**AUDIENCE MEMBER:** Yes.

**MS. TORTOSA:** Z-9 for example, has a cement structure over the top. And below that there's void space of about 15 feet or so. And so when you look at the remove dispose option B for that waste site it doesn't really apply so what you would be doing which is essentially backfilling the cost is lower. There is no remove of removal relating to that option.

**MR. DOWELL:** They don't remove the structure?

**MS. TORTOSA:** Well, they remove the structure but there's no--

**MR. DOWELL:** It's just the structure, right.

**AUDIENCE MEMBER:** The block could be typically guaranteed that 15 feet is being filled.

**MR. DOWELL:** So the structure is removed. No ground soil is remediated underneath it.

**MS. TORTOSA:** Right.

**MR. DOWELL:** Option A has two feet removed. Option C we talked about goes to about 18 feet?

**MS. TORTOSA:** About 30 feet.

**MR. DOWELL:** It's 18 feet below the structure.

**MS. TORTOSA:** Right.

**MR. DOWELL:** Right. And then this one goes 36 feet below the structure.

**MS. TORTOSA:** A total of 90 feet.

**MR. DOWELL:** Ninety feet below the structure. Okay. I'll get that right some day. You can see the variance in cost. We're at $107 million for the preferred option. We go to 600 -- we're 107 million. We go to 600 million roughly for an option that again by our standpoint, by the criteria that we're using to assess the effect on improving the human health and protection to human health and the environment it doesn't bring us that value. So that's how we made that decision.

**MS. SHOEMAKE:** Okay, are there any questions? Yes, sir? Go ahead right there.

**MR. SMITH:** Just a short follow-up question. I

see all this up here but none of them really shows the cost difference for going another two or three feet when you're already going to 20.

**MR. DOWELL:** I would say you could do a linear analysis on that. But there's another element to this, right? And that element is predominant here. It's also predominant in cesium-137. For me to get that material out I've got to send people down there. I've got to get, you know, a plan developed and it's going to be a significant effort and risk exposure to the workers that are going to extract that material. That's another consideration that we made when we look at that material. So again, I hear what you're saying. Why not go for the knee, right? Why not got to 84 or 87 percent which is where that knee would be, another two to three feet. It's a linear relationship, pretty linear relationship from project base for us to take more material. It doesn't add us value and it increases that risk to the worker that's doing it and it doesn't -- you know, it doesn't really add the value of protecting anything more than already is protected.

**MS. SHOEMAKE:** Okay. Are there other questions? Okay, right here.

**MR. KLINGER:** Yeah. Can we go back to slide 30 for just a second?

**MR. DOWELL:** Sure.

**MR. KLINGER:** So that's just showing percentages. What's the total mass of plutonium?

**MS. SHOEMAKE:** Can everybody hear?

**MR. DOWELL:** The total mass of plutonium depends on the site. For instance Z-9 I think is the largest site, has 48 to 50 kilograms of material in Z-9.

**MR. KLINGER:** Okay. So if I were a very clever person in a hundred years from now what would prevent me from opening up a plutonium mine and mining plutonium?

**MR. DOWELL:** Where? In the inner area?

**MR. KLINGER:** Here.

**MR. DOWELL:** Oh, all right. So going back to that I think I talked initially at the start about the inner area, the custodianship that we're going to have there, the Department of Energy, not other federal agencies. It will be the Department of Energy that will have custody of those ten square miles in the inner area. Long term. We will own that area until we are finished with remedial actions in all of those sites. When I say that I mean that any risk to human health and public safety and the environment is remediated.

So you know when I say institutional controls it goes much beyond that. It's presence. There's going to be security. There's going to be some kind of fence system. You know, there will be people working on that site on a

daily basis, not only monitoring the effectiveness of all these remediation actions that we're taking there but also doing exactly that, providing a basis of security. I don't know what that basis is but the way that we design these things is so that, you know, you can't have somebody digging in those areas from a basis of institutional controls to protect that very thing. So from a proliferation perspective when you say mining, I mean you're talking about a full-blown mining operation because this material, we're talking about leaving 25 kilograms of material. And you know, you can go on Gerry Pollet's or Heart of America website and figure out how many bombs that is, you know, depending on what size bomb it is. That's my background in the military was plutonium and weapons.

But to do that you're going to have to get it out of the ground and soil. It's going to be in a configuration. It's not -- you can't just put that material together and go.

**MR. KLINGER:** Yes. But you're a very clever person a hundred years from now.

**MR. DOWELL:** Yeah. I will call that a -- and I'm not trying to offend you or anything. It's just not -- it's a safety term. It's not a credible scenario. It's not credible.

**MR. KLINGER:** I beg to differ. I have one more

follow-up question. Can we go to slide 21? When you say remove sledge liquid from the tank why bother grouting the tank? Why not just remove the tank after sludge and the liquid contained have been removed?

**MR. DOWELL:** Because the brunt of the material at risk is -- at risk is removed. What's left in the tank that--

**MR. KLINGER:** Exactly. Then why not remove the tank?

**MR. DOWELL:** There's no -- because the additional cost is not worth the small benefit of risk to human health and environmental safety. It's just not -- again it's a trade-off of needs across whether or not you put the money into it. Again, removal -- ideally removal would be something we would want to do with all this material. But you know, how far do you want to take. You know, when we're as protective as we need to be by law how far do you take it past that. And what is the criteria for making that decision. That's what you're asking me I think. And that decision gets very challenging when you look at what else you need to do and how fast you want to do that when you're trying to make decisions on what you're doing today. So part of that, you know, it's -- how do I capture that and explain it to you. It's looking at what we want to get done in the immediate future, the resources that we're looking

at, and then balancing those resources according to human need.

Now, here's an example of the hundred-year question because, you know, when I say it's not credible, it's not credible from a standpoint of a safety aspect of getting a criticality mass from that material out of the ground without either being noticed or drawing attention from whatever controls we have in that area at that time. We are there for the long term. I mean that's the premise for the cesium-137. You know, ten half-lives is probably cesium-137 safe. That's 350 years or so.

Our commitment is long term in that area. So that's a fundamental precedent of this whole plan in the inner area is that it's not going to be a river corridor. It's not going to be an outer area. It's not going to be a place where people can recreate. It's not going to a place where fish and wildlife controls it. It's going to have some measures of security. It's not going to be like a plutonium finishing plant with guys in black uniforms and Uzis and all that but it's going to have necessary measures to ensure safety on proliferation as well as the ability for any worker. Because I'm not so worried about a guy with the mining thing coming in and doing it because there are easier ways to get plutonium in the world. I'm more worried about a guy that's digging out there for a utility company and we

don't see him. And that's why we want 15 feet above it especially like in the cesium-137 columns and in these areas where we're trying to remediate.

I know it's a struggle to accept that we're only taking two feet and we're so close to the rest of it. But if you look at the plume in Z-9 as an example that plume goes down to 110 feet. And we cannot go down to 110 feet. We don't have the resources to do that and it doesn't protect us anymore than what we're doing today. And that's the point I'm trying to make.

**MS. SHOEMAKE:** Actually I think we have another question right here.

**MR. SMITH:** Yeah. I'm concerned a little bit about--

**MS. SHOEMAKE:** I'm going to hand you a microphone. I'm sorry.

**MR. SMITH:** I'm a little bit concerned about the cost analysis presented here because they are sort of a little bit here and a lot there. And it strikes me that you're digging say two feet down to the bottom of this thing. Taking this a third foot does not constitute a major increase in cost or structures or devices or anything else. And according to your curve on this one tile field if you went three feet you would get 84 percent of it. That's a significant improvement in just the view of the thing that

the public will have. You've got more than three-quarters of it, that's pretty good. But you only took out 50 percent. That's hardly worth it. It's a public perception problem, not necessarily a risk problem at all.

**MR. DOWELL:** And I'll agree with some of what you're saying. Especially when I first looked at this I was, you know, I was getting into this process of turning over Central Plateau, trying to understand our remediation strategy. I had to change my paradigm because I had to look at it a different way than protection. It was exactly like you say. It's more of a perception if you will. But I don't like saying the work perception with plutonium. I don't know about you but it leaves a bad taste in my mouth. Here's an example of what I'm faced with in Central Plateau. I'm looking at not hiring a GSSC worker so that I can have more money to take plutonium finishing plant to ground by 2015. I'm in the decision basis now on tens of thousands of dollars where I used to be in tens of millions of dollars back in the day. It's a different world out here in budget, guys. And I don't know how I communicate that any better than I can.

When I look at these things I really look at them from a standpoint of what is making us safe. My kids drink out of this aqua filler. They're five end eight. You know, I don't know. It's tough. It's a tough decision. It's a

tough decision what you take out of there. Where are you going on that knee curve on this example. But again, when we go back to protection I had to change the paradigm. It's not about protection. It's about how much material we had. And when I thought about the proliferation things because, you know, I read what Gerry had and I read what you guys had down at Oregon and I tried to understand what the proliferation risk is.

Weapons are very complex things to make it and the most complex part of it is making sure that plutonium does what it's supposed to do. And in doing that it has to have a curie level. And to get that much material out of the footage we're talking about it's highly improbable that that's going to be pulled off. So the proliferation risk to me was like I said, not credible. But the knee curve part I had to change my paradigm and do exactly that. Go back to the balancing criteria in CERCLA and understand looking at what I'm looking at with budgets and what else I want to get done in Central Plateau.

You know, maybe what happens with this is we remediate. We get down into our final rod and get to our decision and we're looking at every five years. And we either see it. You know, we either get updates that there is higher risk and we have to do something else and we'll have technology in place that will be more cost-effective. I

doubt we're ever going to need to do that because what we're seeing today is that that plutonium is not going to move. And that's based on our modeling. It's based on the empirical data that we've got on Z-9. We've got a lot of data from that. So we don't think it's going to ever be about plutonium mobility. But we're going to revisit that every five years just to make sure that it's safe. That's the bottom line.

**MS. SHOEMAKE:** I think we've got a couple more questions to go. We are kind of incringing on our formal public comment discussion time but I think this is probably worth our time. How many questions did we have left? I think I saw two. Ma'am, you want to go ahead?

**MS. LARSEN:** So I just want to clarify that I'm just speaking for myself and making some comments here, not the people that I represent. This decision troubles me more than the decisions that I've seen in 18 years of Hanford cleanup. Just fundamentally it troubles me. The half-life of cesium I'm pretty comfortable with. The stuff is going to go away in a reasonable time frame that we can have some confidence of institutional controls. The plutonium is not going away. I don't care if you deal with it now or 10 years from now or 15 years from now when you've got the money to do it right.

But when you take a look at threats in the world

we're not worried about digging up enough plutonium to make a bomb. We're thinking about a dirty bomb and what the consequences of that are. And we have what I characterize as a plutonium mine out there for somebody to go after. And not in our lifetime maybe but in some lifetime in the future. I don't think we should be making this decision based on budget. And if it's a budget decision then put it off until a point in time. The PFP is your priority. I absolutely support that. That's where we need to go right now. Getting that done, getting it behind us is what we need. But when I think about the evolution of what the bad guys have been going after in the last ten years it's changed so much. We were worried about people stealing plutonium and making a bomb. Then we realized they didn't need to steal it. They could do something with it right there. And that changed our whole scenario. We had an analysis where the bad guys got in and blew it up. Never thought about that before. They thought they would steal it.

So as we evolve in terms of the bad guys and what they might want to do with this material we need to make the most cautious, the most protected decision for us and future generations. And you may not be in a position to do that now. But I just think this is one of the most strategic, one of the most important decisions on the Hanford site and

you need to go cautious. It scares me.

**MR. DOWELL:** And Joy and Pam I didn't see a question in that so I think that's a good comment. And we appreciate your comment, ma'am.

**MS. SHOEMAKE:** Absolutely. Last call for questions before we move to official public comment. Yes, sir.

**MR. MCCAIN:** I just have a quick one. How did radium-56 get listed? It's on your CW-5.

**MR. DOWELL:** I would have to look at the quantity tables. I think I have those with me. It will take me a little time. I'll be doing that while you take comments. Is that all right?

**MR. MCCAIN:** Okay.

**MS. SHOEMAKE:** So who had a public comment they would like to enter into the record? Let me remind you all of the questions and all the questions up until now have been recorded but I would like to open it up for any official comment. Let's get you in the microphone. I know you've got the voice but let's get it official.

**MR. ENGSTROM:** Once again I'm Dale Engstrom and I'm from Oregon. And I'm not speaking for Oregon. I'm speaking for myself. As a citizen of Oregon we worry about what comes down the river and what comes down the river comes from Hanford in terms of groundwater. And J. D. was

absolutely right that Dirk and I who work together do worry a lot about the mobility of plutonium. And that's a question that hasn't been answered very well and we need to look some more at it and I'm going to provide you with a citation list. But let's go to this project, this problem, and talk about our concerns.

First of all it's divided basically into those three groups that we talked about in the first place. And the PW-3 which is the cesium sites and the PW-6 and the CW-5 are not really a concern because there's not a lot of material there. There's not a lot of plutonium to worry about. The real one to worry about is the high-salt plutonium waste disposal sites. The reason they are a problem is because a lot more plutonium ended up there. As an example I see on the chart over here for the Z-1 field that there's 57 kilograms of plutonium in there. And in the Z-9 trench there's 48 kilograms of plutonium in there. And Dirk tells me it only takes four to build a bomb. Now, you're right, it has to be refined and it has to be made into a better product ut there's the beginning of something there just for an idea of what we're talking about.

So what I would like to propose, what I would like to make a comment on is I don't think you're going far enough. I again reiterate the idea that you're taking out just two feet at the bottom of the trench. You're going to

get about 48 to 50 percent of what's in there but we're talking about Z-9 in that case. And you can go just a few more feet as Dick Smith was saying and you could get maybe 89 percent of what is in there. And while you're already there this could be done with an observational approach. And one of the problems you're going to run into with places like Z-9 is when the water ran down the trench there was places that plutonium was being deposited and there were other places where it wasn't. And so it's going to be a very almost mining sort of method moving through the trench cleaning up the stuff that's in there. And as you run into the stuff that you run into in terms of plutonium that would be a good time to extract it and remove it.

One of the things that I would like to suggest to you is the plutonium as Susan said is forever. It is one of those really bad actors. You said we're going to be around here for the long term. Well, the half-life of plutonium is something like 24,000 years. You're going to be around for 240,000 years, sir? I don't think so. So one of the problems is that you can't project that it into the future. You can't guarantee that that's going to happen as a safeguard for human health. So the real safeguard is to get it away from the surface. It's only 15 feet down. To put it somewhere where it will be safe which is deep geologic disposal and to get it out of where it is now. Thank you.

**MR. DOWELL:** Thank you. Real quick before we move on to the next statement, sir, radium-26, I don't see it on my master list. If one of my tech support, I don't know if we have the information available to do that. Determine where the radium-26 is.

**MR. KLINGER:** That's just a natural process.

**MR. DOWELL:** Yeah, but everything that we're putting on here is constituents that came out of process so it should be a process. If it was another form of radon or radium I agree but we've got to figure out what the source was for that slide.

**MR. KLINGER:** I think often in laboratory data this is an artifact.

**MR. DOWELL:** Like a source?

**MR. KLINGER:** No. It's a shoulder that shows up in that region of interest.

**MS. SHOEMAKE:** I'm hoping that we can answer some of those questions as soon as we're completed here. So who else has public comment they would like to give? No? Last call. One more time. Okay. I figured there was one more out there. Susan.

**MS. LECKBAND:** I don't think I need the microphone. I've got a pretty loud voice. I'm speaking for myself now, not the Hanford Advisory Board. I struggled with the slide that J. D. presented with the curve. I

really struggled with that because it is predicated on the assumption that plutonium isn't mobile. And I guess I'm not a scientist and I'm not so convinced that that's absolute. I absolutely believe that we need to go farther. I just think there is a better risk reduction. There is more safety. There's more permanence. The waste load on this site is already extraordinary. And if we can get the plutonium which does have a huge half-life, get it in a deep geological repository I believe that's where it belongs. Thank you.

**MS. SHOEMAKE:** Okay. One last final call. I would like to remind you that on the back of your agenda if you didn't feel comfortable raising your issue here tonight you can go ahead and write your comment on the back of this. Also, too, there are several other ways for you get your comment looked at and reviewed by the agencies. All comments will be responded to in a record response to comment document after this. Are there any final closing thoughts by either Emmie or J. D.?

**MS. LAIJA:** I just wanted to encourage any members of the public who are here tonight we had a survey out on the table as you entered. It's the public involvement survey to help us understand how we can make these public meetings better. If you could fill that out it would be very much appreciated. It does impact how we hold our

public meetings. So if you have a minute we would really appreciate you filling that out for us.

**MS. SHOEMAKE:** Excellent. J. D.?

**MR. DOWELL:** Same. The same goes with us. I'd like to thank you all again for the input, for the questions. If we did leave something unanswered we'll stick around afterwards. I've got the technical folks from the government side as well as our contractor here. Ecology is here, EPA is here. We're here to serve you so thanks for coming.

**MS. SHOEMAKE:** All right. Thanks everyone.

**MS. LECKBAND:** Thank you.

**(Whereupon the meeting was adjourned at 7:40 p.m.)**

CERTIFICATE

I, Kathleen M. McKee, do hereby certify that pursuant to the Rules of Civil Procedure, the witness named herein appeared before me at the time and place set forth in the caption herein; that at the said time and place, I reported in stenotype all testimony adduced and other oral proceedings had in the foregoing matter; and that the foregoing transcript pages constitute a full, true and correct record of such testimony adduced and oral had and of the whole thereof.

IN WITNESS HEREOF, I have hereunto set my hand this 21st day of July, 2011.

/Signed ___ December 9, 2012

Kathleen M. McKee Commission Expiration