October 12, 2011

MEMORANDUM TO: Gregory Suber, Chief
Low-Level Waste Branch
Environmental Protection
and Performance Assessment Directorate
Division of Waste Management
and Environmental Protection
Office of Federal and State Materials
and Environmental Management Programs

FROM: Nishka Devaser, Project Manager ***/RA/***

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SUBJECT: APRIL 27, 2011 PUBLIC MEETING SUMMARY: MEETING TO DISCUSS SECOND REQUEST FOR ADDITIONAL INFORMATION FOR REVIEW OF THE UPDATED PERFORMANCE ASSESSMENT FOR THE SALTSTONE DISPOSAL FACILITY, DOCKET NUMBER PROJ0734

On April 27, 2011, the U.S. Nuclear Regulatory Commission (NRC) met with the U.S. Department of Energy (DOE) to discuss DOE's proposed responses to NRC's second request for additional information made during review of the Performance Assessment for the Saltstone Facility at the Savannah River Site. NRC is reviewing the Saltstone Performance Assessment in accordance with its monitoring responsibilities under Section 3116 of the National Defense Authorization Act (NDAA) for Fiscal Year 2005. The meeting was held at the Aiken Design Center in Aiken, SC from 8:30 a.m. to 3:30 p.m.

Enclosure: Meeting Summary
with Attachments

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Public Meeting Summary: Meeting to Discuss Status of the U.S. Nuclear Regulatory Commission Monitoring Activities at the Saltstone Disposal Facility at the Savannah River Site
April 27, 2011

The purpose of this meeting was for the U.S. Department of Energy (DOE) and the U.S. Nuclear Regulatory Commission (NRC) to discuss the DOE's proposed responses to the NRC's second request for additional information (RAI) during review of the 2009 Saltstone Performance Assessment (PA). This summary captures the major points and path forward of each discussion.

Information on how to obtain video and audio recordings of this meeting is accessible via NRC's document repository, the Agencywide Documents Access and Management System (ADAMS), at ADAMS accession number ML112850138.

Background:

DOE began preparing an update to the "Performance Assessment for the Saltstone Facility at the Savannah River Site" (PA) in 2007 and provided the document to the NRC upon its completion in November 2009 (ML101590008). The NRC began its review immediately and submitted its first RAI on March 31, 2010 (ML100820097). An RAI is a list of questions and/or comments the NRC staff has requested be answered by DOE before completing its review. DOE provided responses to this RAI on July 22, 2010 (ML102090664). Upon review, the NRC staff found some of these responses did not fully answer the questions or raised significant new questions and submitted a second RAI to DOE on December 15, 2010 (ML103400571). DOE provided a partial draft response to the second RAI on April 21, 2011 (ML111180141). The purpose of this meeting was for DOE to clarify its most recent set of responses for NRC staff and for the NRC staff to provide feedback to DOE on their recent draft responses and proposed responses to the remaining RAIs. All presentations and assisting documentation are provided as attachments to this summary and are listed below.

Summary:

On April 27, 2011, NRC management and staff met in Aiken, SC with DOE to discuss DOE's recent submittal of draft responses to 19 (referred to in this summary as the *draft partial response*) of the currently 55 outstanding RAIs regarding NRC review of the 2009 Saltstone Performance Assessment as well as DOE's proposed approach to addressing the remaining 36 RAIs (referred to in this summary as the *complete response*). The DOE's *draft partial response* (DOE, 2011) was provided to the NRC shortly before the public meeting.

After introductions, DOE and its contractor provided a presentation describing proposed path forward to resolving concerns raised by the NRC in its second RAI. DOE's path forward described how Partial Response 1 fit into their overall plan for response. Following additional research and model preparations, discussed in more detail during this meeting, DOE Staff stated they are working toward submitting the *complete response* by August 2011.

Enclosure

DOE began with a high-level explanation of the *draft partial response* and agreed to meet with the NRC at a future date, once the NRC staff has had a chance to review the document more fully.

DOE continued with an explanation on their approach for addressing the remaining RAI comments. While there was general agreement with some of the technical approaches to resolution suggested by DOE, NRC technical staff stated that it requires time for additional analyses to determine if the proposed responses are sufficient. At the end of the meeting, it was decided that supplemental topical discussions between subject matter experts were appropriate and should be scheduled soon. Brief summaries of the discussions will be made public. Topics of discussion are expected to include (but not be limited to) the role and importance of filter fabrics regarding infiltration, technical basis for currently assumed moisture characteristic curves, and the model of Tc release, among others.

DOE stated they are seeking NRC concurrence on the approach to addressing the remainder of the RAIs by mid May. DOE stated plans to complete RAI responses, including new model results, by mid August in anticipation of NRC completing its review of the revised Saltstone PA by mid November 2011. NRC agreed that continuous discussions would benefit the process and agreed to engage in discussions and work toward agreement by mid-May. However, the NRC clarified that its role in this process was to provide feedback on whether DOE's proposed responses appear to address the RAI comments and to clarify the RAI comments if necessary. NRC staff further clarified that its indication that a proposed response appears to be reasonable does not preclude further questions on the topic once the complete RAI responses have been received.

Technical Discussion:

This portion of the meeting summary is intended to cover the entire discussion, and call attention to: (1) major points discussed, and (2) disagreements in approach. Attachment 2, DOE's presentation at the meeting, which describes DOE's proposed RAI resolutions, is included to add background and context to discussion in this section. Table 1 provides a list of common acronyms used throughout the table; Table 2 lists the general topics discussed during the meeting; and Table 3 lists the RAI's discussed, DOE's proposed responses to the RAI, and the primary discussion points that took place during the public meeting between NRC and DOE.

Table 1: List of Acronyms

B	Biosphere (e.g., B-1)
C	Clarifying Question (e.g., C-8)
CBP	Cementitious Barriers Partnership
CNWRA	Center for Nuclear Waste Regulatory Analysis
DOE	U.S. Department of Energy
EPA	U.S. Environmental Protection Agency
FFT	Far-Field Transport (e.g., FFT-1)
FTF	F-Tank Farm
HTF	H-Tank Farm
IAEA	International Atomic Energy Agency
IEC	Infiltration and Erosion Control (e.g., IEC-8)
II	Inadvertent Intruder (e.g., II-1)
IN	Inventory (e.g., IN-5)
LLW	Low-Level Waste
MCC	Moisture Characteristic Curve
NRC	U.S. Nuclear Regulatory Commission
ORNL	Oak Ridge National Laboratory
PA	Performance Assessment
PNNL	Pacific Northwest National Laboratory
RAI	Request for Additional Information
SC DHEC	South Carolina Department of Health and Environmental Control
SDF	Saltstone Disposal Facility
SP	Saltstone Performance (e.g., SP-14)
SRNL	Savannah River National Laboratory
SRR	Savannah River Remediation
SRS	Savannah River Site
UDQE	Unreviewed Disposal Question Evaluation
VP	Vault Performance (e.g., VP-5)

Table 2: General Discussion Topics

General Discussion Topic	Discussion Points
Purpose of Meeting	DOE initiated a brief discussion regarding the objective of the current meeting and asked if the meeting discussions would constitute agreement with the parameter values. The NRC responded that, because NRC received the meeting materials less than one week before the meeting, and due to the complexity of the materials being discussed, the staff would provide general feedback. The NRC staff noted that, in general, the NRC staff must evaluate parameters in the context of the whole performance assessment review and the NRC's final position on topics addressed during the meeting would be provided in the documentation of the staffs review, the TER. NRC staff also indicated the importance of capturing parameter and model uncertainties in Case K.[1] DOE then began a brief discussion on the topic of a potential Case K' (K-prime) in which all of the newest parameter values would be included. NRC staff indicated that any discussion of the details of a potential Case K' would be more appropriate if DOE decided to provide such a case.

Table 3: Major Discussion Points on Specific RAIs

RAI	NRC Comment Summary	DOE Response Summary	Discussion Points
PA-6	Results of analyses run to times beyond or far beyond the performance period appear to underestimate dose by excluding radionuclides and pathways based on their contribution to the	The requested list of radionuclides was provided	NRC stated that this RAI had a simple request of the list of radionuclides, but clarified that the origin of the question was that PORFLOW included only a subset of the radionuclides included in the GoldSim model. NRC staff stated that DOE sufficiently responded to this request and that the 40,000-year dose was not significant to assessing compliance. However, NRC staff noted that the PORFLOW model only included the radionuclides that moved quickly enough to cause a dose in 20,000 years and the PORFLOW

[1] Case K is an additional alternate sensitivity case which is being proposed to further inform the base case in the PA and to support responses to the NRC's RAI-2009-02 with respect to the degradation of the saltstone grout and disposal unit concrete and the release of Tc-99 as the reducing capacity of the cementitious materials is depleted.

RAI	NRC Comment Summary	DOE Response Summary	Discussion Points
	base case analysis at 10,000 or 20,000 years. Although an estimate of the dose at extremely long times is not likely to be necessary for a compliance determination, it is important to understand the basis for any reported results and, when reporting the information, to note important limitations.		model did not include slow moving radionuclides. The use of GoldSim to analyze those slower moving radionuclides to ensure compliance may not be sufficient since NRC staff has concerns about the GoldSim model. DOE continued the discussion by going into some of the details of what changes are being made to the various cases and some of the details of the development of Case K. This discussion was continued later in the meeting when Case K was the primary topic for discussion.
PA-12	The dose consequences from the disposal of containerized Vault 4 waste in Vault 1 should be evaluated.	• No final decision has been made regarding the potential disposal of containerized waste from Vault 4 operations and soil remediation • Operational conditions are not representative of the closure conditions • The facility is still in operation so current inventory is not representative of final closure	In a follow-up question, NRC asked if the Vault 4 soil remediation materials that may be containerized were the same as those already reviewed under the UDQE (ML090120134), or if it was additional material that the NRC had not been aware of. DOE responded by saying that the waste to be containerized from Vault 4 operations and soil remediation is the same material referred to in the UDQE. DOE explained that, at the beginning of Saltstone operations at SRS, some weeping occurred at Vault 4 that contaminated some of the upper area soils surrounding the vault. These soils were then collected and placed into waste containers. One option that was then being explored by DOE was to place those contaminated soils into an empty Vault 1 cell. DOE stated that they then engaged in discussions with SC DHEC regarding this possibility, however, no decisions have been made. Since these discussions took place, containment structures put in place have allowed no additional contamination to reach the surrounding soils to Vault 4.

RAI	NRC Comment Summary	DOE Response Summary	Discussion Points
			DOE continued by explaining that the performance assessment model assumes the Vault 4 walls are fully saturated with pore fluid containing the same concentrations as in the saltstone as a bounding measure to fully account for the potential source term. DOE stated that recent observations of the conditions of empty cells supports the position that no seeping has occurred through the floor of the vault. A UDQE on this topic evaluated the impact of untreated salt solution applied into the soil (ML090120134). DOE stated that the UDQE is not an indication that untreated salt solution entered the soil, rather, it is an evaluation of the potential impacts of this condition using bounding (i.e., salt solution) assumptions. Subsequent to the meeting, NRC staff confirmed that bleed water from the vault 4 weepage event entered the soil and the soil was remediated. A description of the seeps of salt solution through the vault walls and subsequent soil contamination can be found in (ML092300572).
PA-13	The dose consequence from early releases from the vaults prior to completion of the closure cap is not considered.	• Drain systems will remove water from vaults and future disposal cells • Operational control of disposal units includes timely removal of water • The time between the end of the operational life for a disposal unit and closure activities is expected to be relatively short compared to the performance period • Impacts of potential increased oxygen is not risk-significant to the PA results	The DOE response did not fully address the staff's concerns. In addition to the potential increase flow of water through the vault, the saltstone also could undergo increased oxidation and interaction with the environment before the cap is completed. Since, on average, the local area has 30 – 40 days of below-freezing weather, the NRC staff was unsure of the effect freezing temperatures would have on the vault and were unsure as to whether it was accounted for in review. Field evidence, such as the amount of oxidation of core samples, would provide better assurance. The NRC staff would like to continue discussion on this topic. NRC staff also stated that they would consider if this topic could be reviewed under monitoring instead of as part of the PA review.

RAI	NRC Comment Summary	DOE Response Summary	Discussion Points
IN-5	Additional information is needed about the Th-230 inventory assumed for Vault 4 and the process used to confirm that all risk-significant radionuclides have been identified as key radionuclides as waste is disposed and final inventory information becomes available.	• To ensure all risk significant radionuclides were identified for this PA, a conservative approach was used with Th-230 and Ra-226 in equilibrium with their parent U-234 • DOE is confident that sufficient constituents have been evaluated • Future SDF inventory estimates will be based on samples from Tank 50	NRC asked whether samples already taken from Tank 50 have been measured for radium and thorium, and if so, whether these measurements were below the detection limit. The NRC asked for an estimate of the detection limits, and the upper bound of the contents of that stream. DOE responded that the radium measurements were orders of magnitude below the detection limits, and that DOE uses the detection limits as the measurements to be conservative. DOE explained that each time a PA is developed within the PA maintenance program, the opportunity to iterate is relatively limited. DOE reaches a point at which it must lock down the model inputs so that the model can be executed. Minor changes that develop after this point are collected for incorporation in the next iteration of the PA. DOE stated that the inventory program is an example in which a conservative assessment was made early on for simplicity and was not refined. On an annual basis, parameters such as these are reassessed, and when adjustments are merited, DOE will begin planning for the next PA update and will include the list of items required for update when that action takes place. DOE then clarified that this does not mean that every year a new PA is produced. One tool in the PA maintenance program is a special analysis, in which a targeted analysis would take place and specific parameters for which new information has been obtained would be updated. DOE continued the discussion regarding inventory. They stated that as they complete each vault or disposal unit, for example as the filling of Vault 4 is completed, DOE will be reassessing the conservatisms used in the inventory for each cell and then perform a special analysis to incorporate this new and revised information into the PA. As an example, DOE indicated that this type of special analysis was used with the performance assessment for Tanks 18

RAI	NRC Comment Summary	DOE Response Summary	Discussion Points
			and 19 in the F-Tank Farm.
IN-6	Additional information is needed about potential changes to the salt solution feed batch preparation tanks and the sampling methodology that will be used for these tanks.	• Current plans are to continue to use Tank 50 for the LLW streams destined for disposal in SDF • No change to the salt solution feed batch preparation tanks is planned	DOE clarified that, occasionally, alternative plans for disposal actions, such as plans to change the salt solution feed batch preparation tanks, are considered, but not implemented. However, the NRC would be involved in the process should any changes suggested ever move to be implemented. The NRC acknowledged that this would be a good approach.
SP-14	Additional information is needed about the basis for the K_d values used for iodine and radium in cementitious materials.	• After finishing the SDF PA, a new report was issued with K_d values for iodine sorbed to saltstone (SRNL-STI-2009-00636) • Future work regarding radium sorption studies will be considered	NRC asked questions in regard to the document SRNL-STI-2009-00636. NRC noted that this document does a good job of describing the results from the no solids control samples that were used to test if there were sorption to the container walls instead of the solids. In the case of iodine, this document acknowledges the uncertainty in this measurement. Though the document describes the results of these tests well, it provides no description of how these results were implemented. The NRC asked for clarification on how the no solids controls were used. In addition, with regard to the large uncertainty exhibited by iodine in the no solids controls, the NRC remarked on the effect of using a value with such large uncertainty in a deterministic calculation and asked how these uncertainties are accounted for in the PA. DOE responded by explaining that uncertainties were analyzed probabilistically, and that the recently submitted draft partial response to the NRC's second RAI has a section that explains the probabilistic approach to calculating uncertainty. DOE stated that they are using the results of both the deterministic PORFLOW analysis and the probabilistic analysis used in the GoldSim model to conclude reasonable assurance. NRC staff noted that the topic of the uncertainty analysis is a larger

RAI	NRC Comment Summary	DOE Response Summary	Discussion Points
			question than just this RAI because NRC staff has concerns about how the uncertainty analysis was performed. DOE stated that they believed that there were philosophical differences between the NRC and DOE on the uncertainty model. NRC staff stated that they believed that there was not a conceptual difference between the agencies, but that the concern was the structure of the GoldSim model and the linkages between the PORFLOW and GoldSim models. DOE and NRC staff stated that this topic will need to be discussed further.
SP-15	The basis for the adopted technetium pseudo-K_d of 1,000 mL/g for reducing conditions is not sufficient.	Modeling parameters used in the PA are supported by existing literature and experimental results	DOE remarked on the fact that a large discussion had taken place the day before during the NRC's onsite observation to the Saltstone Facility regarding this topic. NRC reiterated that the experimental research performed in response to this RAI provides a good example of the kind of model support for which NRC is looking. However, NRC staff indicated that DOE would need to establish the connection between the experimental conditions and the applicability of those conditions to the expected field conditions. Specifically, NRC staff is concerned that the presence of 2% $H_{2(g)}$ and the exclusion of $O_{2(g)}$ to below 30 ppm may not be representative of field conditions and could artificially suppress Tc oxidation and mobility.
SP-18	Additional justification is required for the uncertainty ranges used for K_d values in cementitious materials.	• 9 radionuclides from 27 samples were measured to assign variability, range, and distribution types • Uncertainty ranges used mean K_d values bounded by ±25% for sandy soil and ±50% for clayey soil • Uncertainty approach is	The NRC staff stated that even though it understands that there is uncertainty in the limited experimental data, there is still some concern with regard to DOE substituting the uncertainty in sandy soil K_d values for the uncertainty in K_d values in a different material. However, the NRC stated that actions could be taken to resolve these matters under monitoring.

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		the best available approach given the lack of measured cement K_d information	
VP-5	The uncertainty in the performance of the vaults is not adequately represented in the PA and the PORFLOW model.	• New disposal units will not be used until performance of the engineered barriers are consistent with the PA • Note that Vaults 1 and 4 were modeled in the PA with cementitious material properties that reflect the known conditions (i.e., fractured concrete)	DOE clarified that design changes to the new disposal cells must remain consistent with the PA and that modifications were made to the new disposal cells so that the disposal cell performance would remain consistent with the PA. DOE also noted that before the disposal units would be used, a UDQE would be prepared to evaluate the actual final configuration of the vault against the assumptions made in the PA. The UDQE documents will be provided to the NRC when they are completed. The NRC acknowledged DOE's decision to maintain consistency between the PA and the new disposal cells and stated that the NRC staff would review the UDQE when they receive it. The NRC continued by stating its concern with the challenge and significance of the material interfaces and discrete features in the new disposal cells. The staff is concerned that these aspects of the new cells may not be incorporated appropriately into the PA. For example, some of the seepage spots in Vault 4 have occurred at discrete features (i.e., joints). The performance of similar features in the FDCs might not be incorporated appropriately in the PA. NRC staff stated that it understands that DOE believes that the walls are modeled with a high hydraulic conductivity that allows flow. However, as described in another RAI, the NRC staff is concerned that the MCCs assumed for these walls do not allow flow through the walls. The NRC staff continued by saying that the way the walls are modeled in the PA is still not reflective of the material interfaces and actual events seen in the field. DOE reiterated that a number of actions need to be taken before the new disposal cells are put into operation (e.g., completion of an

RAI	NRC Comment Summary	DOE Response Summary	Discussion Points
			operational Readiness Review and approval of the new PA). The process currently being used to ensure that the disposal cells are consistent with the PA may not be how DOE handles all changes in design of the cells in the future. Other approaches could be used to ensure that the performance assessment is current, such as using special analyses or UDQEs to evaluate changes in the design of the disposal cells. DOE expressed concern that any monitoring plan developed now is subject to change as disposal action gets closer. DOE stated that they want the NRC to consider the disposal cell designs, but before the new cells are actually put into use, they are subject to change. NRC responded by saying that the NRC's monitoring plan is based on the project's current basis, and the monitoring plan is a living document. When changes are made to applicable parts of the disposal process, changes typically will be made to the monitoring plan. The monitoring plan focuses on the areas where DOE is taking credit for performance and the risk significant features and processes in order to ensure that the NRC will have reasonable assurance that the performance objectives will be met.
FFT-1	Additional justification is required for the uncertainty ranges used for K_d values in site soils.	Geology of the GSA has relatively uniform stratigraphy	NRC had no comments on this RAI during the meeting.
FFT-2	It is unclear whether any site-specific K_d value measurements have been performed for the sorption of radium to soil.	• The requested document was provided • For radium, recommended K_d values increased from 5 to 25 mL/g for sandy soils and from 17 to 185 mL/g for clayey soils	NRC had no comments on this RAI during the meeting. DOE indicated it did not plan to use the new radium K_d values in Case K.

RAI	NRC Comment Summary	DOE Response Summary	Discussion Points
B-1	The basis for excluding biotic transfer factors from the uncertainty analysis is unclear.	• DOE did not develop uncertainty ranges for the transfer factors during initial PA development for several reasons • PNNL-13421, ORNL-5786, and IAEA-364 set precedence for applying geometric means to determine distributions • Applying the geometric mean did not result in significant underestimation of doses • Sensitivity analysis provided in the response to B-2 includes uses bioaccumulation factors from more current data, developed without use of geometric means	DOE indicated it decided not to include these transfer factors in the uncertainty analysis to avoid risk-dilution. NRC staff commented that risk-dilution is most significant when the parameter affects peak timing rather than peak magnitude. Specifically, when a parameter that causes changes in the timing of the peak is modeled stochastically, the peak-of-the-mean value can be diluted by averaging peaks with more zero values. Since the biotic transfer factors strictly act on the concentration and the transitions from concentration to dose, and do not change the timing at all, the NRC stated that it was unsure why including these factors in an uncertainty analysis would cause risk dilution. DOE responded by explaining that they were concerned that adding too many stochastic elements to the GoldSim model could affect the results of the sensitivity analysis and could lead to missing something important in the model. DOE also stated that they had not developed ranges of values to use as stochastic for the transfer factors. Instead, they developed a description of the range of values reported for the transfer factors in the literature. NRC continued by noting that if the uncertainty in the transfer factors is large, it could result in the transfer factors actually being risk-significant. DOE responded by saying that in terms of dose this could be true, however, the transfer factors in this case are being chosen based on the most recent literature values. DOE stated that an analogous situation would be dose conversion factors. Uncertainty ranges are not used with dose conversion factors. Transfer factors, in this case, are being treated similarly, using the most recent scientific data. NRC stated that they will need to review this further, but that the explanation was useful. DOE continued with an explanation about how the new transfer

RAI	NRC Comment Summary	DOE Response Summary	Discussion Points
			factors were obtained from a new IAEA publication, IAEA-472. This document was released after the Saltstone PA was published. DOE stated that these recent values will be used in the RAI responses and the H-Tank Farm PA. DOE then described how the development of a PA extends over a long period of time, and that new information is developed all the time. When new information is released, DOE determines the significance of the new information. NRC then asked whether DOE intends to incorporate the new transfer factors into the PA, or only into the RAI responses (i.e., B-1, B-2, B-3, etc.). DOE stated that they would only be incorporating the new transfer factors into the new Case K, and will not be revising all the models in the PA.
B-2	The animal product pathways included in the dose assessment are the beef, milk, and finfish pathways. A basis for excluding the other animal product pathways (e.g., consumption of poultry and eggs) from the dose assessment is not provided.	• An evaluation of the dose to the MOP from the poultry and egg ingestion was provided • A similar evaluation will be provided for the intruder in the response to II-1	NRC commented that the poultry and egg pathways are important because Ra-226 and Pb-210 are the risk drivers in the PA, although, as discussed in IN-5, the inventory assumed for these radionuclides may be an overestimate. NRC noted that the ingestion of soil by the chickens should be included because it is a source of Ra-226 and Pb-210 uptake into the chicken and eggs that is not accounted for in the model. DOE stated that identifying the parameters to be used for the requested pathway would be difficult. DOE continued by saying that since the Ra-226 inventory may be lower than originally assumed, Ra-226 may not be a risk driver. NRC staff also noted that this question relates to the saltstone radium inventory question. If the radium inventory is much smaller than assumed in the PA, the chicken and egg consumption pathways may no longer be risk significant. DOE then asked whether NRC staff is concerned about soil contamination from well cuttings or irrigation. NRC stated that any

RAI	NRC Comment Summary	DOE Response Summary	Discussion Points
			soil that the chicken could be exposed to should be considered. DOE also asked if another possible approach to addressing this question would be to provide justification why the soil that the chickens could be exposed to would not be contaminated. NRC staff stated that this approach could be acceptable.
B-3	The effects of radionuclide build-up in irrigated soils may be underestimated.	• Assessment takes credit for leaching and the assumed build-up time is 25 years • Radionuclide-specific soil build-up factors were calculated and provided • The improved soil build-up model was included in the dose model described in response to B-2	The NRC staff noted it is still reviewing this response, and that it is interested in the basis for the assumed build-up time of 25 years.
B-4	The soil to plant transfer factors may be too low due to the elimination of the leafy plant component.	• Leafy vegetables had been considered negligible to the total vegetable production • A sensitivity analysis incorporated several improvements and updates to the dose calculation based upon new references (see B-2)	DOE indicated that the contribution from leafy vegetables is reflected in the transfer factors being used for Case K. NRC staff indicated it is still reviewing the numbers provided by DOE on the leafy vegetables.
B-5	The drinking water ingestion rate of 337 L/yr is inconsistent with an average member of the critical group definition.	• The water ingestion rate in the PA (337 L/yr) is based on an EPA survey • Increasing the water ingestion rate 16%	NRC staff noted that the effect of different ingestion rates on total dose is not linear, but the effect on dose from drinking water is obviously linear, which simplifies evaluation of the issue.

RAI	NRC Comment Summary	DOE Response Summary	Discussion Points
		represents a 10% increase in the total dose for Sectors B and I	
C-8	For benchmarking cases B-E (Sections 5.6.2.3.5 though 5.6.2.3.8), the PA compares the doses predicted based on the PORFLOW model and post-benchmarking GoldSim model resulting from “all modeled radionuclides”. Clarify whether the term “all modeled radionuclides” in this context refers to the original list of radionuclides included in the PORFLOW model or a smaller list of radionuclides modeled during the benchmarking effort.	The requested list of radionuclides for the Inventory Inputs was provided.	NRC stated that the response seems reasonable.
C-22	Figure 4.2-15 in the PA shows the vertical hydraulic conductivity of the lower lateral drainage layer reducing in time to approximately 4E-5 cm/s by 20,000 years. However, the PORFLOW model files indicate that	The PORFLOW time period of 15,000 years to 20,000 years (a period spanning 5,000 years) uses the average value spanning that time period (4.9E-3 cm/s) rather than an endpoint value (4E-5 cm/s)	NRC stated that the response seems reasonable.

RAI	NRC Comment Summary	DOE Response Summary	Discussion Points
	the hydraulic conductivity is only reduced to 4.9E-3 cm/s for all cases. The flux out of the vaults is directly dependent on the infiltration rates. As indicated in IEC-8, the conservatism of the calculations for the hydraulic conductivity of these lateral drainage layers is not clear and according to the PORFLOW model files, it is not clear if these calculations were implemented appropriately. Clarify why different hydraulic conductivity values were implemented in the PORFLOW model.		
C-23	WSRC-STI-2008-00244 discussed the installation quality of the geomembrane as “Good”; however, the HELP model also requires the specification for the placement quality of the geomembrane. The Help model input data in	Consistent with HELP model documentation	NRC stated that the response seems reasonable.

RAI	NRC Comment Summary	DOE Response Summary	Discussion Points
	Appendix J of WSRC-STI-2008-00244, listed the geomembrane placement quality as a "2". According to the "HELP User's Guide for Version 3", an entry of 2, "assumes exceptional contact between geomembrane and adjacent soil that limits drainage rate (typically achievable only in the lab or small field lysimeters)." The basis for selecting the placement quality of the geomembrane should be provided.		
PA-8	The base case does not represent the current and reasonably expected future conditions.	• Case A in the PA is considered the Base Case from which additional model conservatisms are employed to evaluate pessimistic considerations of system behavior • Case K will evaluate the impact from additional considerations identified	NRC staff asked whether DOE planned to add the biosphere series of RAIs to the list of RAIs addressed in Case K[2]. DOE responded that the biosphere responses are incorporated into Case K, but that they were not included in the list on slide 29 because they were included in the draft partial response, or the first package RAIs. NRC then asked whether the new Case K was going to be a PORFLOW case exclusively, or if a probabilistic uncertainty analysis would be run. DOE responded that it will be a PORFLOW case exclusively, in that it will not include a probabilistic run.

[2] Case K is an additional alternate sensitivity case which is being proposed to further inform the base case in the PA and to support responses to the NRC's RAI-2009-02 with respect to the degradation of the saltstone grout and disposal unit concrete and the release of Tc-99 as the reducing capacity of the cementitious materials is depleted.

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		in the RAIs.	
PA-9	Conclusions about the conservatism of the synergistic case are not clear as certain assumptions appear to be overly optimistic, while other assumptions are potentially conservative.	• The Sensitivity Case presented in the PA is reevaluated with additional radionuclides • Case K has been developed to evaluate the impact from additional considerations identified in the RAIs specified in PA-9	NRC staff did not provide comment on the approach during this meeting. NRC will provide comment on DOE's approach after review of the formal responses DOE plans on submitting in August 2011.
PA-10	Assumptions in the PA regarding the conceptual model and parameterization may result in unsupported modeled flow rates through saltstone.	Case K has been developed to evaluate the impact from additional considerations identified in the RAIs specified in PA-10	NRC staff did not provide comment on the approach during this meeting. NRC will provide comment on DOE's approach after review of the formal responses DOE plans on submitting in August 2011.

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IEC-8	The PA should provide a technical basis for the long-term performance of the geotextile filter fabric and the upper and lower lateral drainage layers.	• The conservative colloidal clay infiltration assumption also encompasses any degradation that might occur due to silt migration • PORFLOW uses the average value over the time period rather than the endpoint value • Case K assumes that the rate of clay migration into the drainage layers is twice that assumed in Case A.	DOE stated that the lateral drainage layer assumptions were pessimistic. NRC staff asked what the pessimistic assumptions were. DOE stated that the concentration of solids in the infiltrating water was assumed to be equal to the maximum concentration they have observed and all of the solids that enter the drainage layer are assumed to remain in that layer. The NRC staff then asked about the assumed lifetime of the geotextile layer. DOE then stated that they were not taking credit for this. NRC staff noted that in the model, only colloids were allowed into the sand drainage layer, so, in the model, the geotextile layer is preventing any larger particles from filling in that layer. However, the sand drainage layer is immediately underneath the backfill, so it is important to be confident that this soil will not infiltrate the sand layer and plug it. NRC staff also expressed concern about the amount of risk reduction achieved in the model by the lateral drainage layer. NRC staff stated that an amount of model support commensurate with this level of risk reduction was needed, but the justification the NRC has received so far is not adequate. NRC staff also stated that any other events and processes that could change behavior of the drainage layer should be considered or justification should be provided for omitting them. DOE staff stated that anything that could impact the sand layer could also impact other parts of caps. NRC staff noted that a difference between the lower and upper lateral drainage layer is that the upper lateral layer is modeled in the HELP code, while the lower layer is modeled using PORFLOW. The amount of shedding modeled for the upper drainage layer is much less than the amount modeled for the lower layer, and NRC staff expressed concerns that the different codes gave different amounts of credit for the same process. DOE noted that the higher level of performance modeled for the lower layer may be due to the contrast between the

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			permeable lateral drainage layer and the impervious vault roof under that layer rather than the use of the PORFLOW code. To address this, DOE proposed to increase the degradation of both the vault roof and the drainage layer. NRC staff stated that they were not comfortable with DOE's proposed approach of doubling the rate of clay migration into the drainage layer because there was no basis for the assumed doubling and because it was not confident that colloid infiltration is the only possible mechanism of degradation. It would be better for DOE to use values in the model that they had model support for. DOE stated that in their RAI response, it would provide more discussion on the mechanisms for degradation and would provide justification for why the lateral drainage layer assumptions are appropriate. NRC staff noted that providing support for assumptions regarding the lateral drainage layer degradation may be challenging because a large amount of support is needed due to the large amount of credit taken in the model for the lateral drainage layer. NRC stated that a justification is especially needed for excluding larger particles from the assessment of the plugging of the lateral drainage layer. NRC and DOE agreed to discuss this topic more at a later date.
SP-1	Additional justification is required for the assumption that saltstone is hydraulically undegraded for 20,000 years.	• Current and planned future research will be discussed • Case K has been developed to evaluate the impact of saltstone fully degrading hydraulically within 10,000 years	The NRC asked what DOE meant by "fully degraded." DOE stated that, as it relates to assumptions of degradation used for modeling purposes, any of the cementitious materials will physically degrade by the formation of cracks. Under the assumption of degradation, the DOE's working definition of "fully degraded" is the presence of a fracture spacing approximately 10 cm. This fracture spacing is sufficient to bring the equivalent hydraulic conductivity of the composite fractured medium up to a value that is similar to, or a little

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			higher than, the surrounding soil. NRC asked whether fracture modeling is done the same way as in other cases or since this is bulk degradation, would DOE just be using the bulk hydraulic conductivity. DOE stated that they would be modifying the hydraulic properties (saturated conductivity as well as the MCCs). NRC then reiterated the question and asked whether flow considered will be porous flow or a fractured network flow. DOE responded that it will be a porous medium flow. NRC then stated that in reality, in a system such as this one, a significant fraction of water would be flushed through the fractures, and not much through the bulk wasteform, making the fractures oxidize much more quickly. The NRC asked how this will be handled. DOE stated that this question will be answered during the shrinking core discussion associated with SP-13. NRC asked whether degradation will be modeled as occurring gradually, ramping up, or some other scenario. DOE stated that the degradation is assumed to be gradual. Degradation is assumed to begin early and full degradation would be complete at 10,000 years. NRC staff then stated that it wants to ensure that uncertainty in degradation is captured in the progression of the saltstone hydraulic properties for up to 10,000 years. DOE stated that some of the parameter values have a physical basis; some were chosen to illustrate sensitivities and did not have a mechanistic basis. A 10,000-year degradation of saltstone was chosen to reflect an increase in flow through the monolith over what is assumed in the base case.
SP-2	A basis is required for the modeled extent of saltstone fracturing.	• The observation of "saltstone cracking" reported in	NRC decided the next four RAIs were so interrelated that it might be clearer if their discussion points were merged. This section of discussion points applies to SP-2, SP-3, SP-5, and SP-6. The NRC

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		SRNL-ESB-2008-00017 does not imply that fracturing is occurring within the saltstone monolith • Further observations of saltstone conditions will be presented as they become available • Case K includes a time variant progressive fracturing model of the saltstone monolith	staff commented that, because of the complexity of these topics, more discussion and review is needed before it takes a position on these topics. The NRC staff commented on the fact that DOE's approach seems reasonable, but whether this approach is acceptable will depend on implementation. The NRC asked whether DOE would provide details to the NRC on how data for the MCCs were generated during this meeting or later with the second set of RAI responses. DOE stated that they are willing to provide this information. NRC and DOE agreed that further discussion would take place, but would include materials that are pre-decisional, meaning that the discussion would be non-public. NRC stated that its objective would be to understand in any preliminary results how the flow fields behave. NRC staff is also interested in reviewing saltstone saturation values to determine which part of the MCCs were being used. DOE stated have not yet run a case with these MCCs, so DOE suggested that it could provide example plots from Case A showing the suction level of the different stages over 10,000 years. This would provide some insight into the relevant suction levels in different regions. The NRC stated that they could look in the PORFLOW files now to determine the suction ranges and map that information onto the MCCs to see if the range might be appropriate with these hydraulic conductivities. NRC noted that since they already have the PORFLOW files that they could review the files to assess the relative saturation levels. Assuming that Case K stays within those bounds, this could provide the NRC confidence. NRC asked about the basis for the degradation parameters (SP-6) and how the diffusion coefficient for the saltstone degradation
SP-3	The MCC for intact saltstone implemented in the PORFLOW model does not sufficiently account for experimental uncertainties and is inconsistent with literature results for material similar to saltstone and other cementitious materials.	• Case K includes MCCs that are more representative of literature values and are incorporated within the progressive fracture model identified in the proposed approach for SP-2 • Figure SP-3.1 illustrates an example of MCCs reflecting progressive fracturing at the start of various time steps with comparison to the Case A model and soils.	
SP-5	Additional support is needed for the hydraulic conductivity of intact	• The hydraulic conductivity of intact saltstone was based on information	

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	saltstone that is used in Case A, Case B, Case C, Case D and the synergistic case.	available at the time of PA development • Additional research is being planned to continue investigating parameters that impact saltstone hydraulic conductivity • Case K assumes the hydraulic conductivity of intact saltstone is 1E-08 cm/sec, which is the highest reported value for intact saltstone and is based on laboratory testing at a curing temperature of 22^{o}C	assumed in the model is handled. DOE stated that their process for deriving the hydraulic properties is to assume a fracture frequency that increases over time in a semi-log manner. DOE increased the diffusion coefficient from its initial value to the fully degraded value which would be something comparable to soil, using the same semi-log relationship. NRC expressed concern that, since actual fractures would not be considered in the PORFLOW model, the shorter diffusive length to the fractures will not be captured. DOE stated it expects that advective flow will dominate the release, so they have focused more on the advective release than the diffusive release. DOE also noted that the model is a porous media model in which the flows are uniformly distributed through the region and there is no distinct treatment of fracture flow. NRC staff noted that even if the release is driven by advective flow, the radionuclides could be diffusing to the fractures followed by advective transport out of the wasteform. This is a different conceptual model than flow through the whole block. NRC staff indicated that it was unsure of the effect of the differences between the conceptual model (fracture flow) and the implementation (porous flow). NRC staff expressed concern that the case will not reflect a system that is highly fractured. DOE summarized that an implicit assumption is being made that local equilibrium is taking place between the fractures and the matrix and that they agree that this presents an implicit modeling bias. DOE also noted that for radionuclides that are highly retarded, the use of a porous media model is conservative compared to a fracture flow model because radionuclides that are not located near the fracture are essentially inaccessible. DOE stated that the porous media model is neutral (neither conservative nor non-
SP-6	Additional basis is required for the values of the effective diffusivity of intact and degraded saltstone used in the base case and sensitivity cases.	• Current value in the PA assumes that intact saltstone has an effective diffusion coefficient associated with ordinary concrete (1E-07 cm^2/sec) • Latest SIMCO testing indicates that intact saltstone has an effective diffusion coefficient of 1E-08 cm^2/sec • Case K assumes that the diffusion coefficient of intact saltstone starts at the value used in Case A but increases as the	

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		saltstone degrades	conservative) for radionuclides that are not highly retarded.
SP-7	Additional bases are needed for key assumptions used in the simulation of sulfate attack with the STADIUM code.	• Technical publications of the Cementitious Barriers Partnership (CBP) will be examined to identify those having bearing on sulfate attack in Saltstone and provide a comparison between related CBP and SIMCO analyses. • Case K will investigate system performance by increasing concrete degradation to reflect model uncertainties	NRC stated that when reviewing degradation resulting from sulfate attack in the synergistic case, it was unclear which direction of flow through the walls was the most conservative. The importance of this comment was that the NRC found that the seemingly "conservative" approach in the synergistic case to heavily degrade the walls did not provide a truly conservative assessment because it resulted in the flow bypassing the wasteform by going through the walls. DOE stated that this topic would be revisited in a later RAI.
SP-12	Model support is needed for the process models supporting PA predictions of E_H-pH evolution for cementitious materials.	• Model predictions will be compared to any existing experimental data to provide model support. Plans for further experiments examining E_h and pH changes will be developed. The experiments will likely be a combination of accelerated flow and sequential batch experiments. • Case K includes a 25% reduction in the pore fluid volumes necessary for E_h and pH transitions	The NRC inquired about the use of the phrase "any existing experimental data" by asking if there were any existing experimental data. DOE staff stated that it is unsure if appropriate experimental data exist. NRC continued by providing a short assessment of work performed by the NRC contractor, CNWRA. NRC stated that some of the work at the CNWRA provides some insight into pH and E_h transition times. CNWRA has seen that E_H transitions of samples ground in air take place at 50-60 pore volumes. The NRC noted it understands that this value may or may not be similar to the field. In addition, the NRC indicated a non-mechanistic reduction of E_h and pH transition times by 25% reduction is not expected to be helpful. DOE stated that this particular topic may be a modeling change for

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			Case K and may be more suited for PA maintenance (or monitoring). NRC and DOE agreed on the importance of adequate model support for the pore volumes required for transition.
SP-13	The effect of limiting the shrinking-core model to the effects of the E_H evolution of saltstone on Tc should be analyzed.	• Using PA Table 4.2-18,DOE will identify any other radionuclides that would be appropriate to include in a shrinking core model for E_H and pH evolution • Case K includes a modified shrinking core model for technetium that could be applied to other radionuclides	The discussion for RAI's SP-13 and SP-17 were merged during the meeting. A DOE subcontractor provided a detailed explanation regarding the oxidation process assumed in Case K. The fracture spacing proposed for Case K is too small for the oxidation to be handled in PORFLOW using the same methodology as was used in the other cases, so a different approach is proposed for Case K. Specifically, the model assumes a tendency for the fracture faces to have liquid films at the face, but for the fracture itself to be air filled in oxygen-rich regions. Oxygen is transported into the wasteform through a diffusive process. DOE stated that the amount of oxidation can be calculated analytically outside of PORFLOW. In this calculation, the fraction of the wasteform that is oxidized over time is tracked. An effective K_d value is then calculated based on the fraction of the material that is oxidized. The NRC stated that since material transport is a highly non-linear process, they did not believe that averaging K_d values is a valid approach to calculating movement of materials. The NRC continued by noted that they had previously stated that there was less concern with the value of the K_d chosen for reduced technetium than there was for the value in which the technetium is oxidized because technetium release is expected to be dominated by release from the oxidized region. However, if an approach in which the reduced K_d and oxidized K_d values are averaged, the specific value selected for the reduced K_d value may be more important. The NRC and DOE agreed that they would reconvene to discuss
SP-17	Neglecting gas-phase diffusion of oxygen appears to be inconsistent with the PORFLOW result that saltstone fractures are not completely saturated.	Case K will implicitly incorporate combined gas-phase and liquid-phase oxidation of fractured reducing cementitious materials. This oxidation sub-model will be based on the approach of Smith and Walton.	

RAI	NRC Comment Summary	DOE Response Summary	Discussion Points
			this approach. DOE stated that they would try to get NRC a short assessment of the approach prior to the next discussion.
VP-2	Additional basis is required for neglecting disposal unit degradation mechanisms other than sulfate attack.	• Case K assumes that the disposal unit concrete fully degrades within 10,000 years (3,500 years for Vault 4 roof; and initially degraded for the walls of Vaults 1 and 4) • DOE will investigate whether any studies have been conducted on corrosion of reinforced concrete at SRS	The discussion for RAI's VP-2 and VP-3 were merged during the meeting. NRC inquired about the integrity of the vault floor within 10,000 years, where DOE assumes no degradation. DOE responded by saying that in Case K, all concrete in the vaults and disposal cells is assumed to degrade within 10,000 years, except for certain discrete structures (Vault 4 roof and Vaults 1 and 4 walls) which are assumed to be degraded earlier.
VP-3	The effect of modeling disposal unit floors as completely reducing for the entire performance period, and beyond 20,000 years, should be analyzed.	• Preliminary review of inspections of the Vault 4 floor does not indicate the existence of potential leak paths at bolt locations • Case K includes a progressive fracture growth model of the floor of all of the disposal units	
VP-6	The bypassing of flow through Vaults 1 and 4 walls may not have a physical basis.	• The initial hydraulic conductivity of the walls for Vaults 1 and 4 is based on a macroscopic crack model to acknowledge current wall seepage • Case K utilizes a different	NRC stated that since there is more than an order of magnitude of water modeled as flowing through the vault walls than through the saltstone, the model does not seem to be consistent with expected behavior. The NRC staff does not expect the walls to be significantly more degraded (i.e., have a higher hydraulic conductivity) than the saltstone for the 10,000-year compliance period. The NRC staff noted that the modeled flow through the saltstone dropped precipitously when DOE went from the base case to a case with fractured walls. This implies that fracturing the walls

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		initial cracking spacing that results in a hydraulic conductivity 100 times less than used in Case A. Figure VP-6.1 illustrates the moisture characteristic curves (MCCs) used for the Vault 1 and Vault 4 walls for Case K, the PA Base Case (Case A), and soils.	provides better performance and indicates that the model is not reflecting reality. The NRC staff stated that it is important for the behavior predicted in the mathematical model to be consistent with the conceptual model. The NRC stated that they would need more time to review DOE's revised approach because they received these materials shortly before the discussion. The NRC asked about the applicability of the MCCs to some of the different materials. NRC staff is concerned as to whether or not these curves can adequately represent fracture flow at various saturation levels. The NRC staff stated that it understood that modeling fracture flow is difficult and that these curves may be able to capture the range of fracture flow expected in the actual system. In addition, the NRC expressed concern regarding the use of these MCCs to capture some of the range of expected conditions. The basis for this comment was a set of experiments performed at the DOE Hanford site in Richland, Washington, in which measurements had high variance and uncertainty.

Questions and Comments from Members of the Public:

Tom Clements, Friends of the Earth, expressed an appreciation for the current dialog and an appreciation for the NRC's monitoring role. Mr. Clements continued with a suggestion that other animals be included in the biosphere model. Mr. Clements continued by stating that he was unaware of the onsite observation that had taken place the day before and asked when the report from this visit might be made available. NRC stated that it would be made available 60 days from the observation visit and stated that Mr. Clements, as a member of our service list, will be receiving the onsite observation when it is made available. The NRC continued by stating that anyone interested in receiving updates can email the project manager present at the meeting to be put on distribution, James Shaffner (James.Shaffner@nrc.gov), or the normal project manager (Nishka.Devaser@nrc.gov), and they will be put on the list.

Mr. Clements then asked about the Vault 4 seepage and the new disposal cell design changes. Mr. Clements asked whether information on these topics will be made available in the staff's observation report. Mr. Clements expressed interest in the current status of these topics, potential paths forward, and recent discussions or decisions made on these topics.

DOE provided a brief update on new cell construction. Following the rejection of the dye tests, DOE made some design changes to the new disposal cells 2A and 2B, and retested the cells. DOE stated they are completing the process of construction. DOE did note that the changes made reduced the amount of available disposal volume in the cells 2A and 2B. DOE continued by stating that it took some valuable lessons learned from the experience with the new cells that will be reflected in the design and construction of the remaining Future Disposal Cells in the Z-Area.

DOE continued by explaining that DOE has not yet approved use of the disposal cells, which are being constructed by a subcontractor. DOE expressed the view that, since no disposal actions have taken place in the cells, the new cells do not fall under NRC monitoring responsibilities because NRC is tasked with monitoring DOE's disposal actions.

Mr. Clements then had a question for DOE regarding the footprint for the next four cells (Disposal Cells 3A, 3B, 5A, and 5B). Mr. Clements then stated that it sounds as though DOE has already broken ground for the next four cells prior to receiving permission from SC DHEC. He continued by asking for confirmation, whether it is true that certain activities are acceptable to SC DHEC prior to construction permitting. DOE confirmed that this was the case.

Mr. Clements had one additional question. Mr. Clements then asked about the consideration of trees in the biosphere analysis. After erosion and degradation of the local area surrounding and above the backfilled cap, Mr. Clements asked how much consideration is being taken with regard to concentration and uptake through the roots and into leaves and in the event of buildup on the ground when the leaves fall to the top of the soil. Mr. Clements stated that he was asking this question after receiving some indication of its importance from individuals involved in research at the Chernobyl facility.

DOE indicated that trees are the primary mechanism for degradation of the closure cap, however, the trees roots do not go deep enough to come into contact with the potentially contaminated soils under the cap. Thus, the only way for trees to uptake radionuclides from the soils would be if trees grew on land that had previously been irrigated with contaminated water.

NRC and DOE both remarked on the depth of the cover, and DOE continued by stating that they have a minimum of 10 feet of coverage between the lower part and upper part of the erosion barrier of the cap. DOE stated that in the cover design, the infiltration rate is controlled by relying on a middle drainage layer having a minimum thickness of 1 foot. DOE indicated that the cover is designed to have an average middle drainage layer thickness of approximately 15 to 20 feet.

Meeting Attendees

Andrew Persinko	U.S. Nuclear Regulatory Commission
Christepher McKenney	U.S. Nuclear Regulatory Commission
George Alexander	U.S. Nuclear Regulatory Commission
Christianne Ridge	U.S. Nuclear Regulatory Commission
Karen Pinkston	U.S. Nuclear Regulatory Commission
James Shaffner	U.S. Nuclear Regulatory Commission
Thomas Gutmann	U.S. Department of Energy
Sherri R. Ross	U.S. Department of Energy
Patricia Suggs	U.S. Department of Energy
Linda Suttora	U.S. Department of Energy
Armanda Watson	U.S. Department of Energy
Shelly Wilson (by phone)	South Carolina Department of Environmental Health and Control
Virginia Dickert	Savannah River Remediation
John L. Donnell	Savannah River Remediation
Rebecca Freeman	Savannah River Remediation
Keith Liner	Savannah River Remediation
Kent Rosenberger	Savannah River Remediation
Richard Sheppard	Savannah River Remediation
Malcolm Smith	Savannah River Remediation
Steve Thomas	Savannah River Remediation
John Tseug	Savannah River Remediation
W.T. (Sonny) Goldston	Savannah River Nuclear Solutions
Heather Burns	Savannah River National Laboratory
David Crowley (by phone)	Savannah River National Laboratory
Greg Flach	Savannah River National Laboratory
Bob Hiergesell	Savannah River National Laboratory
Thomas Clements	Friends of the Earth (Member of the Public)

Attachment