September 2, 2005

MEMORANDUM TO: Scott Flanders, Deputy Director
Environmental and Performance Assessment Directorate
Division of Waste Management
and Environmental Protection
Office of Nuclear Materials Safety
and Safeguards

THRU: Ryan Whited, Chief **/RA/**
Low-Level Waste Section
Environmental and Performance Assessment Directorate
Division of Waste Management
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FROM: Anna Bradford **/RA/**
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Division of Waste Management
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Office of Nuclear Materials Safety
and Safeguards

SUBJECT: AUGUST 17-18, 2005 MEETING SUMMARY: MEETING WITH U.S. DEPARTMENT OF ENERGY TO DISCUSS RESPONSES TO REQUEST FOR ADDITIONAL INFORMATION FOR THE SAVANNAH RIVER SITE

On August 17-18, 2005, staff and management from the U.S. Nuclear Regulatory Commission (NRC) and the U.S. Department of Energy (DOE) met to discuss DOE's responses to NRC's Request for Additional Information (RAI) regarding salt waste processing and disposal at the Savannah River Site. The RAI was transmitted by NRC on May 26, 2005, and the responses were transmitted by DOE in two separate packages on July 1 and July 15, 2005. The meeting summary is attached for your use.

Attachment 1: Summary of Meeting
Attachment 2: Attendee List
Attachment 3: Handout on DOE sensitivity analyses (ML05240015)

cc: K. Picha/DOE

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cc: K. Picha/DOE

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ML052450020

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ATTACHMENT 1: SUMMARY OF AUGUST 17-18, 2005, OPEN MEETING TO DISCUSS RESPONSES TO REQUEST FOR ADDITIONAL INFORMATION FOR THE SAVANNAH RIVER SITE

Introduction

On August 17-18, 2005, staff and management from the U.S. Nuclear Regulatory Commission (NRC) and the U.S. Department of Energy (DOE) met to discuss DOE's responses to NRC's Request for Additional Information (RAI) regarding the draft waste determination for salt waste disposal at the Savannah River Site (SRS). A similar meeting had been held on July 27, 2005, at NRC Headquarters. This meeting was open to the public and was held near the SRS site at the North Augusta Community Center in North Augusta, GA. Prior to the meeting, NRC staff and contractors participated in a tour of the SRS tank farms and saltstone disposal facility.

In addition to NRC and DOE staff and contractors present at the meeting, representatives of the National Academy of Sciences, the U.S. Environmental Protection Agency, the South Carolina Department of Health and Environmental Control, the Defense Nuclear Facilities Safety Board, the SRS Citizen Advisory Board (CAB), the Consortium for Risk Evaluation with Stakeholder Participation (CRESP), and the public were present.

The list of attendees is included as Attachment 2. A table similar to a handout that was used during the meeting to discuss DOE's sensitivity analyses is Attachment 3; the attached table reflects changes discussed during the meeting. NRC's RAI letter is available in ADAMS under ML051440589 and DOE's responses are under ML051920416 and ML052030364. The summary of the July 27, 2005 meeting is in ADAMS under ML052160180.

Action items that arose out of this meeting are listed below. The action items from the July 27, 2005, meeting are not included below because they are not new actions; however, DOE has not yet formally responded to the action items from that meeting.

Discussion

The purpose of the meeting was to continue discussions regarding DOE's RAI responses. The technical issues documented in the action item list from the July 17, 2005, meeting were discussed further.

August 17, 2005, Meeting

The NRC staff asked several questions regarding the release and transport modeling, especially with respect to the distribution coefficients (Kd's), colloid transport for plutonium, and use of a Kd release model. The DOE staff stated that they only used Kd values for clay in one unit that contains large amounts of clay; otherwise, they used values for sand. The value used for Kd for uranium was based on site-specific measurements. The DOE staff stated that they used 0.1 ml/g for soil for technetium instead of zero because of the findings of the Kaplan 2004 report; they had previously used 0.36 ml/g and so decreasing the value to 0.1 ml/g seemed conservative. The DOE staff does not believe that colloidal transport of plutonium is likely to be significant in the SRS environment. The DOE staff believes that use of a Kd model for radionuclide release is more conservative than a solubility model, and does not believe that there are cases in which it may not be conservative to assume that aqueous concentrations go

down as the source term is depleted because the inventory is not depleted much in 10,000 years.

The NRC staff noted that only one vault was simulated for the flow to the compliance node in the Performance Objectives Demonstration Document (PODD) and asked whether the variability of flow from other vaults would be expected to be similar. The DOE staff said they expected it would be similar and that any variability would be taken into account as they design the facility and site the vaults. The DOE staff stated that future performance assessments would evaluate the impact from multiple vaults explicitly.

The NRC staff asked why the PODD assumed that post-drilling did not occur until 1,000 years. The DOE staff stated that they do not think post-drilling is a credible scenario and it is only used as a sensitivity case. The NRC staff asked whether an assumption of a shorter timeframe for occurrence of drilling would affect the results because of the presence of cesium, and DOE staff stated that it probably would. For the agricultural scenario in the Special Analysis (SA), NRC staff indicated that although it was a good approach for examining uncertainties with regard to the erosion barrier, DOE would need to evaluate the sum of fractions at different times if it was used as anything but a sensitivity case. The NRC staff also stated that the drilling dilution factor should be based on site-specific information rather than generic information.

The NRC staff noted that the SA references literature for the neglect of flow through cracked underground structures in the unsaturated zone and asked for the specific reference. The DOE staff stated that it was Or, D. And M. Tuller (2000).

The NRC and DOE staffs then discussed possible erosion of the engineered cap. The NRC staff stated that they would need more design detail to be able to reach a conclusion that DOE's assumptions about the cap are reasonable. For example, DOE needs to show a basis for their assumption that the cap will not fail in less than 10,000 years due to erosion. The DOE staff pointed out that they do assume hydraulic failure of the cap prior to 10,000 years but do not assume that the cap will fail due to erosion. The NRC staff recommended that DOE use the guidance in NUREG-1623 for erosion control design.

The NRC staff asked how the impacts of longer roots were included in the simulation of the bottom part of the engineered cap. The DOE staff stated that they assumed that the roots cause holes in the cap, which allow water into the lower part of the formation [upper geosynthetic clay layer (GCL)], that the clay zone will tend to self-heal, and that they did not extend the root damage below the GCL.

The NRC staff asked about the ranges in precipitation used in the modeling. The DOE staff responded that they used a range from 30 to 70 in/yr. The DOE staff assumed a 25% increase in average precipitation and regenerated 100 years worth of data using that 25% increase, and used this information in their more recent sensitivity analyses that have not yet been provided to NRC.

The NRC staff asked about the perforations in the ceiling of the vaults that are used to pour the grout material and whether those pipes will be subject to corrosion and therefore possibly open fast pathways for water. The DOE staff responded that such corrosion may be possible, the pipes will be filled with clean grout, and that there will be 18 to 24 inches of clean grout under

the pipes. The NRC staff asked whether there would be a shrinkage gap between the clean material and the roof. The DOE staff responded that there would probably be a very small gap, but that there are engineering techniques to fix small cracks. The NRC staff stated that they saw cracks on the roof of the vaults during the site tour and asked when those cracks had formed. The DOE staff stated that the cracks formed relatively early during roof construction and that there had been no cracking since then. The NRC staff questioned whether it was possible to perform a geophysical survey to see if cracks had formed. The DOE staff responded that such surveys were probably technically possible but that pulse-echo radar would not have 25-ft penetration. During discussion of the sheet drain, DOE staff stated that the sheet drain is anchored to the vault walls with 1-in nails, that the condensate probably becomes slightly contaminated as it flows over the saltstone, and that DOE treats the condensate as waste.

August 18, 2005, Meeting

The NRC staff asked whether DOE had additional information supporting its assumptions of no flow through fractures in the saltstone. The DOE staff indicated that they are performing a sensitivity analysis that assumes that soil infills the cracks, and are also looking at variations in precipitation and suction pressures. The DOE staff also indicated that in the model, they turned the cracks 90 degrees from the expected direction of formation to be perpendicular to the slope of roof because the model is two dimensional. The model had approximately two or three cracks for the length of the Vault 4 design. The NRC staff asked how confident DOE is in the moisture characteristics curve, especially at the extreme values. The DOE staff responded that they are not too concerned about the extreme ends of the curve because the vaults and saltstone don't get that dry. The NRC staff clarified that they were concerned with the wet end of the curve because the unsaturated hydraulic conductivity may drop off very rapidly with decreasing saturation for a material with fine pore structure. The DOE staff stated that they have lab data for the wet end of the curve and they are addressing it in the sensitivity analysis. The DOE staff also stated that they do not assign moisture characteristic curves to the fractures themselves and that they do not change the curve as the drainage layer gets plugged. The NRC staff responded that this approach seemed fairly reasonable but that more model support is needed because the results seem to be fairly sensitive to fracture flow. The NRC staff stated that DOE should consider simulations of the expected scale, properties, and geometries of the cracks to see if the results would be consistent with the current modeling approach. The DOE staff pointed out that the engineered cap has an upper drainage layer that helps to protect the lower drainage layer, and that they could change the depth of the drainage layer if needed to prevent conditions of sufficient saturation to occur in the lower drainage layer that may result in flow through the fractures.

The DOE staff stated that they are performing a sensitivity analysis for vault saturation and asked whether that analysis would respond to NRC's previous request for more model support on the results for vault saturation. The NRC staff said the sensitivity analysis partly addressed the request but that the analysis showed that the results changed by a factor of five. The NRC staff indicated that DOE would need to determine whether it considers the results to be sensitive to this parameter and the combined impacts if changes in other parameters results in large changes of dose. The NRC staff asked how much the condensation affects the saturation of the vault and saltstone. The DOE staff responded that it does not affect the saturation very much because the saltstone is already saturated, and the Core Laboratories report is the only data they have for moisture characteristic curves.

The DOE staff then reviewed a handout regarding additional sensitivity cases they are evaluating in response to NRC's previous questions (see Attachment 3), and stated that they would provide a document that discusses and interprets the sensitivity analyses findings. The NRC staff asked whether DOE had measurements of the concrete hydraulic conductivity. The DOE staff responded that measurements for both the saltstone vaults and the E-Area vaults are in the Core Laboratories report. The NRC staff stated that 10^{-12} cm/s is on the low end of the scale for hydraulic conductivities and DOE staff responded that the cement used has properties that does put it at the low end of the scale because it is better than typical concrete. The DOE staff stated that they had references for similar cement and would provide them to NRC. The NRC staff noted that other references provided in the response to RAIs provide hydraulic conductivities that are larger than the Core Laboratories data, and that DOE should enhance their support of the values used in the performance assessment.

In response to NRC staff questions, DOE staff stated that they would add uranium as one of the radionuclides considered in the sensitivity analyses. The DOE staff will also add a modeling run that assesses flow through cracks and 100% oxidation of the saltstone. The DOE staff stated that technetium is the only radionuclide affected by a change from reducing conditions to oxidizing conditions in the Bradbury and Sarott reference; however, a recent PNL report seemed to also show changes for neptunium and uranium, so DOE will assess those also. The DOE staff indicated that they used professional judgment in selecting the Region 2 data in Bradbury and Sarott.

The NRC staff asked whether DOE believed it should analyze a case in which the vault does not act as a diffusive barrier; for example, because of possible corrosion, expansion, and cracking of the perforations for the grout fill pipes. The DOE staff indicated that there could be an engineering fix to prevent that type of corrosion, such as encasing the fill pipes in concrete.

The NRC staff stated that some of the data regarding relative permeability in the Core Lab report appeared to be incorrect and it did not appear that DOE had provided references for the values used. The DOE staff responded that they did not believe that the suspect data was used to develop the curves for relative permeability but that they had not been able to determine what data was used to generate the curves. The NRC staff stated that DOE should resolve the issue by either showing the relative permeability is not important to the model results or choosing conservative values that could be supported.

The NRC staff stated that DOE should not apply a screening factor of 10% of the total contribution to dose to the base case being analyzed, but instead should apply it to a conservative case when determining highly radioactive radionuclides. The NRC staff stated that DOE's current application of 10% to the base case is not an acceptable methodology and that DOE might be inappropriately eliminating radionuclides that should be included in the analysis. The DOE staff asked whether NRC staff was stating that the 10% should be applied to a conservative inventory estimate. The NRC staff responded that the entire analysis should be conservative, not just the inventory estimates. For example, if a conservative case was used, then technetium, iodine, and neptunium would probably contribute more than 10% of the dose and so they would probably be included as highly radioactive radionuclides. The NRC staff pointed out that the list of radionuclides considered should be defensible, given the uncertainties in the assumptions and the analysis, and that DOE should examine the results of the sensitivity analyses that they are currently running to determine whether the list of highly radioactive radionuclides needs to be revised.

The DOE staff stated that it would no longer be referencing the Reboul 2005 document ("Removal of Highly Radioactive Radionuclides from SRS Salt Waste") in its response to RAI 11, but instead would reference a report titled "Radionuclides in SRS Salt Waste." The DOE staff provided a short overview of this report. The NRC staff asked why this document used a 1% screening level for inhalation dose to workers and a 10% level for the all-pathways dose to the public, and DOE staff responded that they believed use of 1% was reasonable because the public calculations were based on a full dose assessment whereas the worker inhalation doses were based on a more limited assessment. The DOE staff also stated that the concentrations for waste in this report were not the same as those used in the PODD because this report is analyzing waste prior to treatment. NRC staff stated that they were unable to determine the basis for the decontamination factors assumed in this document and asked for supporting references. The NRC staff asked whether DOE would submit the Reboul report as committed to in the July 27, 2005, meeting. The DOE staff responded that it did not believe that there was any technical information in the Reboul report that was not provided in the "Radionuclides in SRS Salt Waste" report and therefore they did not intend to submit the Reboul 2005 report.

The DOE staff stated that a final waste determination will not be issued until after NRC's consultation is complete (i.e., DOE will not provide a draft revised waste determination to NRC prior to NRC completing its Technical Evaluation Report).

The DOE staff committed to providing a written submittal responding to all of the action items from the July 27, 2005, meeting and this meeting, but did not provide a date for the submittal.

Public Comment

August 17, 1005, Meeting

A member of the SRS CAB thanked the NRC for holding the meeting and inviting the public. He pointed out that he wants the tanks closed in a timely fashion while considering possible risks, such as operational and legal risks. He asked when NRC would be done with its review. NRC staff responded that they were still waiting to receive information from DOE, and that NRC will complete its review in as timely a manner as possible. The CAB member then asked if NRC would have the funding to continue work if such work extended into the next fiscal year. The NRC staff responded that it did not know of any reason it would have to stop work due to the change in fiscal year.

Another member of the CAB invited NRC staff to attend the CAB's September meeting to provide an update on its review of DOE's draft salt waste determination. The NRC staff committed to letting the CAB know whether it could attend on those dates.

August 18, 2005, Meeting

A member of the SRS CAB stated that he was concerned about a seamless transition at the end of the fiscal year given the different funding schemes required by the National Defense Authorization Act of Fiscal Year 2005. Another CAB member stated that he believed that the uncertainty analysis should be adequately considered.

A CAB member thanked the NRC staff for having an open meeting to discuss technical issues and noted that it was important that adequate resources be applied to completing the review.

Another CAB member reiterated the invitation for the NRC to attend its September meeting.

Closing Remarks and Action Items

The DOE staff stated it would provide the following to NRC:

1. Information supporting the neglect of colloidal transport in DOE's modeling (RAIs 48, 58)
2. Information supporting the use of release models based on solubility rather than Kd's (RAI 60)
3. Additional information, such as design details, supporting assumptions that the cap will not fail due to erosion in less than 10,000 years (RAIs 22, 25)
4. Bases for values used in the sensitivity analyses described in the handout
5. References for hydraulic conductivity for the vaults (RAI 32)
6. Include one isotope of uranium as a radionuclide considered in sensitivity analyses
7. Provide results of sensitivity analysis for flow through cracks and 100% oxidation of the saltstone
8. Information on why the impacts of the fill pipes' possible corrosion, expansion, and resultant cracking would be minimal
9. Information supporting assumptions of relative permeability
10. Interpretation and analysis of sensitivity analyses results and conclusions, including any resultant changes in the list of which radionuclides DOE considers to be highly radioactive (RAIs 19, 11)
11. Information supporting the decontamination factors assumed in the report titled "Radionuclides in SRS Salt Waste) (RAI 11)

The NRC action items are:

1. Respond to the CAB regarding possible NRC staff attendance at the CAB's September meeting.

ATTACHMENT 2: Attendees at NRC and DOE Meeting to Discuss Responses to Request for Additional Information August 17-18, 2005

NAME	AFFILIATION	PHONE NUMBER
August 17, 2005		
Anna Bradford	NRC/NMSS	301-415-5228
Scott Flanders	NRC/NMSS	301-415-6717
Mark Thaggard	NRC/NMSS	301-415-6971
Ryan Whited	NRC/NMSS	301-415-5135
Michele O'Shaughnessy	NRC/NMSS	301-415-6659
David Esh	NRC/NMSS	301-415-6705
Ted Johnson	NRC consultant	304-876-2209
David Pickett	CNWRA	210-522-5582
Roberto Pabalan	CNWRA	210-522-5304
Stuart Stuthoff	CNWRA	210-522-6828
Shelby Perkins	DOE	202-586-8078
Kathy Martin	DOE-GC	202-586-4467
Brenda Hays	DOE-SRS	803-952-8562
Ken Picha	DOE-EM	202-586-9726
Terry Spears	DOE-SRS	803-208-6072
Bill Clark	DOE-SRS	803-208-0231
Randy Kaltreider	DOE-HQ	301-903-4259
Mark Gilbertson	DOE-EM/HQ	202-586-5042
Thomas Frank England	WSRC	803-557-8825
Ginger Dickert	WSRC	803-208-1527
Steve Thomas	WSRC	803-208-8064
Eloy Saldivar	WSRC	803-208-0245
CNWRA (on phone)		
August 18, 2005		

NAME	AFFILIATION	PHONE NUMBER
Anna Bradford	NRC/NMSS	301-415-5228
Scott Flanders	NRC/NMSS	301-415-6717
Mark Thaggard	NRC/NMSS	301-415-6971
Ryan Whited	NRC/NMSS	301-415-5135
Michele O'Shaughnessy	NRC/NMSS	301-415-6659
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Stuart Stuthoff	CNWRA	210-522-6828
Bill Clark	DOE-SRS	803-208-0231
Terry Spears	DOE-SRS	803-208-6072
Ginger Dickert	WSRC	803-208-1527
Steve Thomas	WSRC	803-208-8064
Eloy Saldivar	WSRC	803-208-0245
Ed Stevens	SRNL	803-725-7751
Chris Langton	SRNL	803-725-5806
Elmer Wilhite	SRNL	803-725-5800
Sebastian Aleman	SRNL	803-725-8040
Bob Hiergesell	SRNL	803-725-5219
Jim Cook	SRNL	803–725-5802
Greg Flach	SRNL	803-725-5195
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NAME	AFFILIATION	PHONE NUMBER
CNWRA (on phone)		