February 15, 2013

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

FROM: Nishka Devaser, Project Manager ***/RA/***
Low-Level Waste Branch
Environmental Protection
and Performance Assessment Directorate
Division of Waste Management
and Environmental Protection

SUBJECT: JANUARY 17, 2013, PUBLIC MEETING SUMMARY: MEETING TO DISCUSS WASTE DISPOSAL AT THE SAVANNAH RIVER SITE IN ACCORDANCE WITH THE NATIONAL DEFENSE AUTHORIZATION ACT FOR FISCAL YEAR 2005, DOCKET NO.: PROJ0734

On January 17, 2013, the U.S. Nuclear Regulatory Commission (NRC) and the U.S. Department of Energy (DOE) engaged in a public meeting to discuss DOE's new modeling activities pertaining to the Savannah River Site, Saltstone Disposal Facility. The meeting was conducted in accordance with NRC's monitoring and DOE's disposal responsibilities under Section 3116(b) of the National Defense Authorization Act for Fiscal Year 2005. The meeting was held in a NRC conference room and also by teleconference on January 17, 2013.

CONTACT: Nishka Devaser, FSME/DWMEP
(301) 415-5196

Enclosure:
Meeting Summary

cc: WIR Service List

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OFC	DWMEP	DWMEP	DWMEP	DWMEP	DWMEP	DWMEP
NAME	HFelsher	ARidge	AWalker-Smith	CMcKenney	GSuber	HFelsher
DATE	01/30/13	01/30/13	01/30/13	01/31/13	02/14/13	02/15/13

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Public Meeting Summary: Meeting to Discuss Waste Disposal at the Savannah River Site in Accordance with the National Defense Authorization Act for Fiscal Year 2005

Purpose

The primary purpose for the meeting was for the U.S. Department of Energy (DOE) to present information about DOE's new modeling activities pertaining to the Savannah River Site, Saltstone Disposal Facility (SDF) to the U.S. Nuclear Regulatory Commission (NRC). This was the fourth of a series of meetings that the NRC and DOE are holding to discuss DOE's path forward to resolve issues identified in the Technical Evaluation Report (TER) (NRC, 2012) under NRC's monitoring responsibilities under the National Defense Authorization Act for Fiscal Year 2005 (NDAA).

Background

On March 31, 2005, DOE submitted to NRC the *Draft Section 3116 Determination for Salt Waste Disposal Savannah River Site* (DOE-WD-2005-001, Rev. 0) to demonstrate compliance with the NDAA criteria, including demonstration of compliance with the performance objectives in 10 CFR Part 61, Subpart C. In its consultation role, the NRC staff reviewed the draft waste determination (WD). In the TER issued in December 2005 (NRC, 2005), the NRC documented the results of its review and concluded that there was reasonable assurance that the applicable criteria of NDAA could be met, provided certain assumptions made in the DOE analyses were verified via monitoring. Taking into consideration the assumptions, conclusions, and recommendations in the NRC 2005 TER, DOE issued the final WD in January 2006 (DOE-WD-2005-001, Rev. 1).

DOE submitted a revised Performance Assessment (PA) to NRC in 2009 (SRR-CWDA-2009-00017). The NRC reviewed the revised PA, including holding public meetings, sending requests for additional information, and reviewing the DOE responses. On April 30, 2012, NRC issued both the TER (NRC, 2012a) and a Type IV Letter of Concern (NRC, 2012b). In the 2012 TER, NRC concluded that it did not have reasonable assurance that salt waste disposal at the SDF met the performance objectives in 10 CFR Part 61, specifically §61.41. The Type IV Letter of Concern formally communicated the NRC concerns to both DOE and the South Carolina Department of Health and Environmental Control.

In July 2012, DOE responded to the Type IV Letter (DOE, 2012a; DOE, 2012b). DOE's response included information about an updated technetium-99 (Tc-99) inventory projection for the newly constructed structures (i.e., DOE referred to as "disposal cells"); and information about the DOE Case K and K1 uncertainty and sensitivity analyses. In response to DOE's submittal, NRC issued a letter of acknowledgement, dated August 31, 2012 (NRC, 2012c), stating that a (Type II) Letter to the U.S. Congress is not needed at this time. Based on the NRC's TER analyses and DOE's revised Tc-99 inventory, the staff determined that, if DOE's new projected Tc-99 inventory for the newly constructed disposal structures is correct, then it is unlikely to cause an off-site peak dose exceeding the requirements of §61.41 (i.e., 0.25 mSv/yr (25 mrem/yr)).

Meeting Summary

After introductions, the NRC Director of the Environmental Protection and Performance Assessment Directorate, Division of Waste Management and Environmental Protection, Mr. Aby Mohseni, welcomed the participants and expressed interest in having meetings such as these and in continuous dialog between the NRC and DOE to resolve the issues identified in NRC's TER. Mr. Mohseni followed with a request for Mr. Larry Camper to visit the SRS site on March 27, 2013. Following Mr. Mohseni's opening remarks, Mr. Terrel (Terry) Spears of DOE-Savannah River (DOE-SR) provided opening remarks highlighting the continuous improvement progress made during the past year related to Tc-99 characterization, variability in plant operations, and research and development related to supporting assumptions made in the modeling.

After the completion of opening remarks, Mr. Kent Rosenberger, of Savannah River Remediation (SRR), provided DOE's presentation (SRR-CWDA-2013-00004).
Mr. Rosenberger's presentation began with a description of the purpose of this meeting. That description has been repeated here for clarity:

> *"A new Special Analysis (SA) will be developed that incorporates recently available technical data and modeling lessons learned from other activities to resolve uncertainties and address Technical Evaluation Report* [NRC, 2012a] *issues*
>
> *Meeting objectives are to:*
>
> - *Brief approaches to modeling attributes, and*
> - *Elicit NRC input on the modeling attributes"*

The primary bullet points of the major comments are included below. Comments are in order of the presentation slides (SRR-CWDA-2013-00004).

Table 1: Comments or Questions From Technical Discussions

Slide Number	Comment or Question
General	DOE indicated that, per DOE requirements, the PA Maintenance Program describes the research and development activities that generate data supporting the modeling described during the presentation. Since the Maintenance Program is an ongoing process, future research and development efforts are planned to continue to strengthen and support modeling activities and will be made available as they are completed.

Slide Number	Comment or Question
	The NRC staff expects that it will be important to examine intermediate model outputs to ensure the mathematical model cases adequately represent DOE's conceptual models. Important intermediate outputs are expected to include, but not be limited to, the following examples: o Flow through the various engineered cover layers (including the drainage layers) as a function of time; o Flow through fractures and joints in saltstone and the disposal structure concrete as a function of time as compared to the amount of water flowing through the porous matrices; o The physical distribution of radionuclides in the saltstone and disposal structure as a function of time (e.g., to evaluate whether the projected retention of radionuclides in the disposal structure concrete is realistic); and o Saturation of saltstone and disposal structure concrete as a function of location and time.
	The NRC staff discussed the variation in the average peaks and valleys in Tc inventory across the disposal cells given the new inventory information that was provided to NRC in July 2012. DOE indicated that the histograms from the RAI response (SRR-CWDA-2010-00033, Rev. 1, IN-3 response) are still the best available information related to Tc inventory distributions.
Slide 7	The NRC staff requested the basis for the selection of data between the two reports in discussed in this slide. The NRC staff also requested clarification of the comment in the conclusion of report SRNL-STI-2012-00596 specifically related to the relationship of pH vs. solubility in PNNL-21723 given the approximately constant pH shown in PNNL-21723 Figure 3.2.
Slide 8	The NRC staff recommended that DOE consider oxygen from liquid flowing through saltstone as well as diffusion of gaseous oxygen at all saltstone surfaces. If either mechanism is not included in the revised model, then justification should be provided. o The justification could require multiple calculations to demonstrate which mechanism is dominant given a range of assumptions about hydraulic conductivity, oxygen concentration in subsurface gas, diffusivity, and the effects of degradation on diffusivity and hydraulic conductivity. o The NRC staff suggested that DOE provide support for how DOE represents fracturing. Justification should be provided for the surface area modeled in the explicit shrinking core model to explain how it accounts for fracturing. o The NRC staff requested a copy of the peer-reviewed solubility report when available.

Slide Number	Comment or Question
Slide 10	The NRC staff indicated that DOE should account for degradation mechanisms that are not currently included in the CBP Toolbox. The NRC staff also indicated that DOE should account for feedback mechanisms and the coupling of multiple degradation mechanisms.
Slide 12	The NRC staff asked if DOE considered any potential negative impacts from degradation of High Density Polyethylene. DOE clarified that the High Density Polyethylene does not impact degradation mechanisms internal to the cell and waste form.
Slide 13	The NRC staff considers intermediate outputs of the flow field important to demonstrate the amount of flow going through the wasteform and disposal structure. (e.g., a flow balance through walls, matrix, around monolith, through fractures, through joints) and NRC staff recommended that DOE provides it.
Slide 15	The NRC staff suggested that DOE provide support for assumptions related to saltstone saturation and noted that intermediate outputs showing saturation as a function of time and location in the wasteform and disposal structure may provide useful insight into the potential effects of saturation.
Slide 17	The NRC staff suggested that non-linear effects on fluid flow from different materials should be evaluated with support provided to validate the values chosen. o Blending Moisture Characteristic Curves (MCCs) of differing materials is not likely to be straightforward and is likely to require a significant amount of justification if MCCs significantly reduce the projected water flow. MCCs are a function of pore size distribution. Degradation alters the pore size distribution and may not linearly change the MCCs. Based on the complexity of this subject, NRC anticipates the need for some level of support (i.e., reasonable technical basis) from experimental evidence rather than a mathematical justification alone. o MCCs assume steady state conditions. Episodic flow would invalidate the use of MCCs. If saturation remains relatively constant at 96% then this would not have a significant impact. However, if saturation diminishes significantly, then use of the MCCs may become difficult to support.
Slide 21	The NRC staff recommended that DOE consider additional support for the use of average water-to-premix ratios given that there are startup and shutdown flushes that change the water-to-premix ratio significantly for short periods of time. The NRC staff noted that it may not be possible to adequately represent the system with average values if short-term increases in the water to premix ratio cause connected pathways of grout with elevated hydraulic conductivity or diffusivity. DOE will provide new information from test reports as available. It may be possible to refine the estimate of volume of saltstone affected by higher water-to-premix ratio from flushing.
	DOE mentioned that thermocouple data has been obtained and a report is being prepared for transmittal to NRC, as discussed in the NRC December 2012 Onsite Observation Visit Report.

Slide Number	Comment or Question
Slide 28	The NRC staff recommended that DOE provide support for degraded values of effective diffusivity used in the model. DOE stated that justification will be provided for the end state in a new report.
	The NRC staff requested that DOE consider the impact of degradation on the progression of the oxygen diffusion front. Specifically, the NRC staff noted that if the physical properties of the cementitious material change behind the oxidation front, the progress of the oxidation front may not conform to the typical square root of time relationship.
Slide 29	The NRC staff suggested that additional model support is likely to be needed for the assumed reducing capacity of 607 µeq/g in saltstone.
	The NRC staff recommended that the rate of sulfide leaching and its impact on the reducing capacity of saltstone be considered (e.g., sulfide leaching reported in PNNL 21723).
	The NRC staff is concerned that modeling the disposal structures as reducing without considering fracture flow explicitly could result in an unrealistic level of performance. The NRC staff does not expect the disposal structures to remain intact (i.e., without cracks) throughout the performance period. As discussed in Section 2.13.3.2 (NRC, 2012a), the NRC staff believes that the presence of fast pathways will limit the ability of the disposal structures to retain radionuclides. Recent DOE research indicates the equilibration time for precipitation of Tc-99 under reducing conditions may be long compared to the time required for liquid to flow through a fast pathway in disposal structure concrete. As discussed during the December 6, 2012, onsite observation visit, the NRC staff is concerned that the retention capability of the disposal structure may be overestimated if this behavior is not represented in the model.
	The NRC staff recommended that DOE provide support for how radionuclides are retained in a degraded (i.e., cracked) floor.
Slide 33	The NRC staff requested additional information related to the hydraulic properties associated with gravel (e.g., the MCC used).
Slide 35	The NRC staff recommended that DOE support the model simplifications made to represent disposal structure columns and modeled material properties. In particular, the NRC staff expressed concern that the assumptions DOE outlined regarding the hydraulic conductivity of the columns in the future disposal cells (i.e., initial and as a function of time) appear to be unrealistic and would tend to result in flow bypassing the saltstone grout. Those assumptions could result in a significant amount of credit to the SDF and would therefore require a commensurate level of justification.

Slide Number	Comment or Question
Slide 39	The NRC stated that the reference that DOE cites in the PA supports a K_d value of 30 mL/g for selenium in oxidized middle aged cementitious materials. DOE's proposed value of 150 mL/g is reported for the more reduced form of selenium, selenite, rather than for the more oxidized form selenate. Therefore, the value of 30 mL/g appears to be more appropriate for oxidized region II and III cementitious material than DOE's proposed value of 150 mL/g (NRC, 2012a, page 108). DOE indicated that the values used in the modeling will be reconfirmed.
Slide 40	The NRC requested clarification of the following points: o Most recent dose methodology from sensitivity run will be continued (i.e., dose methodology improvements in Case K sent to NRC in SRR-CWDA-2012-00103 will be retained). o Chronic intruder methodology will not change; but, the doses predicted by the model may change.

Public Comments/Questions

Mr. Tom Clements, the meeting participant from The Alliance for Nuclear Accountability, asked DOE whether the discussion about the closure cover during the meeting pertained only to the smaller disposal structures or if it also pertained to DOE's proposed larger, 30-million gallon disposal structures. DOE explained that the discussion did not explicitly address the larger structures; but, that the planned minimum cover thickness does not depend on the disposal structure design. In response to a related question from Mr. Clements, DOE stated the closure cover design is not final. DOE explained that it is now establishing minimum requirements for the closure cover. Those requirements are assumed to be met in the performance assessment model. DOE further explained that, at the time of closure, DOE will use the best technology available and will ensure that the minimum requirements are met.

Closing Remarks

Mr. Nishka Devaser, NRC Project Manager for SDF, provided closing remarks. Mr. Devaser expressed appreciation to participants from DOE-SR and SRR that made the trip up to NRC headquarters in Maryland for the meeting and to other attendees for calling in to the teleconference.

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Meeting Attendees

George Alexander	U.S. Nuclear Regulatory Commission
Nishka Devaser	U.S. Nuclear Regulatory Commission
Harry Felsher	U.S. Nuclear Regulatory Commission
Esther Houseman	U.S. Nuclear Regulatory Commission
Lisa London	U.S. Nuclear Regulatory Commission
Christepher McKenney	U.S. Nuclear Regulatory Commission
Aby Mohseni	U.S. Nuclear Regulatory Commission
Karen Pinkston	U.S. Nuclear Regulatory Commission
Christianne Ridge	U.S. Nuclear Regulatory Commission
James Shaffner	U.S. Nuclear Regulatory Commission
Gregory Suber	U.S. Nuclear Regulatory Commission
Sherri Ross	U.S. Department of Energy - Savannah River
Terry Spears	U.S. Department of Energy - Savannah River
Daniel Ferguson	U.S. Department of Energy - Savannah River
Linda Suttora	U.S. Department of Energy
Frank England	Savannah River Remediation
Ben Dean	Savannah River Remediation
Mark Layton	Savannah River Remediation
Kim Hauer	Savannah River Remediation
Kent Rosenberger	Savannah River Remediation
Richard Sheppard	Savannah River Remediation
F. Malcolm Smith	Savannah River Remediation
Steven Thomas	Savannah River Remediation
Shelly Wilson	South Carolina Department of Health and Environmental Control
Martha Berry	U.S. Environmental Protection Agency
Robert Pope	U.S. Environmental Protection Agency
Tom Clements	The Alliance for Nuclear Accountability