Department of Energy
Savannah River Operations Office
P.O. Box A
Aiken, South Carolina 29802

JUL 2 6 2012

Mr. Larry Camper, Director
Division of Waste Management
and Environmental Protection
Office of Federal and State Materials
and Environmental Management Programs
U.S. Nuclear Regulatory Commission
11545 Rockville Pike, Mail Stop T8F5
Rockville, MD 20852-2738

Dear Mr. Camper:

SUBJECT: Additional Response to *Technical Evaluation Report for Revised Performance Assessment for the Saltstone Disposal Facility at the Savannah River Site, South Carolina* and Letter of Concern

References: 1) Letter of Concern (Type IV) Regarding US Department of Energy Disposal Activities at the Savannah River Site Saltstone Disposal Facility (Letter, Satorius to Gilbertson dated 4/30/12)
2) Technical Evaluation Report for the 2009 Performance Assessment for the Saltstone Disposal Facility at the Savannah River Site (Letter, Camper to Gilbertson, dated 4/30/12)
3) Transmittal of Updated Saltstone Disposal Facility (SDF) Information Developed since August 2011 (Letter, Spears to Camper dated 6/13/12)
4) Letter of Concern (Type IV) Regarding US Department of Energy Disposal Activities at the Savannah River Site Saltstone Disposal Facility (Letter, Spears to Satorius, dated 7/12/12)

This letter is in further response to the Letter of Concern (Reference 1) and associated Technical Evaluation Report (TER) (Reference 2). This letter supplements the information previously provided to the Nuclear Regulatory Commission (NRC) by References 3 and 4. The Department of Energy (DOE) appreciates NRC's review of the DOE's *Performance Assessment for the Saltstone Disposal Facility at the Savannah River Site* dated October 2009 (SDF PA). The Enclosure identifies DOE's approaches to address NRC's TER and Letter of Concern.

This transmittal along with References 3 and 4 completes DOE's commitment described in Reference 4 to respond to NRC's TER and Letter of Concern prior to initiating disposal operations in Saltstone Disposal Unit (SDU) 2. As previously stated in Reference 4, disposal operations are scheduled to resume in SDF later this fiscal year (FY), beginning with SDU 2 in August 2012. After filling SDU 2, operations in SDU 3 and 5 are anticipated to occur through FY 2015.

Consistent with DOE's performance assessment maintenance program described in the enclosure, DOE will consider NRC's SDF TER and Letter of Concern when performing new modeling, incorporating any available new information described in the Attachments to the Enclosure for all planned SDF operations. DOE would like to engage in technical discussions with NRC staff later this year prior to performing the new modeling activities. DOE anticipates completing the new modeling late next calendar year. DOE intends to provide the new information to NRC and South Carolina Department of Health and Environmental Control in advance of additional disposal operations (i.e. SDU 6 and subsequent units) to facilitate NRC's

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monitoring role under Section 3116(b) of the Ronald W. Reagan National Defense Authorization Act for Fiscal year 2005.

DOE looks forward to continuing discussions with NRC pertaining to SDF operations. Our next public meeting is scheduled for Monday, August 6, 2012 starting at 1:00 at the Aiken Design Center in Aiken, SC to discuss References 3 and 4. Furthermore, I welcome NRC staff for the onsite observation monitoring visit of SDF on August 7 and 8, 2012.

If you have any questions regarding this letter, please call me at (803) 208-6072, Ms. Sherri Ross at (803) 208-6078, or Ms. Patricia Suggs at (803) 208-6804.

Sincerely,

Terrel J. Spears
Assistant Manager
Waste Disposition Project

WDPD-12-64

Enclosures:
Assessment of Key Monitoring Factors
in NRC TER for the SDF PA

cc:
Nishka Devaser, NRC (w/ Enclosure)
Shelly Wilson, SCDHEC (w/ Enclosure)

Enclosure 1

Assessment of Key Monitoring Factors in the Nuclear Regulatory Commission Technical Evaluation Report for the Revised Performance Assessment for the Saltstone Disposal Facility

July 2012

Purpose

The purpose of this document and the attached matrix is to address the key monitoring factors presented in the *Technical Evaluation Report For the Revised Performance Assessment for the Saltstone Disposal Facility at the Savannah River Site*, ADAMS accession number ML121020140 (hereinafter referred to as the SDF TER), issued by the Nuclear Regulatory Commission (NRC) on April 30, 2012. The SDF TER presents the NRC's assumptions, analysis and conclusions resulting from its technical review of the Department of Energy's (DOE's) *Performance Assessment for the Saltstone Disposal Facility at the Savannah River Site*, SRRCWDA-2009-00017, Revision 0 (hereinafter referred to as the SDF PA). The NRC also transmitted (from Satorius to Gilbertson) a related *Letter of Concern (Type IV) Regarding U.S. Department of Energy Disposal Activities at the Savannah River Site Saltstone Disposal Facility Site*, NRC ADAMS accession number ML120650576 (hereinafter referred to as the Letter of Concern).

DOE appreciates NRC's review of the SDF PA. In response to NRC's SDF TER and Letter of Concern, DOE has fully considered and identified approaches to address the NRC observations in this document and attached matrix. The attached matrix provides a detailed description of DOE's approaches to address the factors cited in the SDF TER. The Letter of Concern is addressed in this document and in the July 12, 2012 response to NRC. Additional considerations regarding the NRC's observations in the SDF TER and Letter of Concern are described below.

Additional Considerations

Background

Under the Atomic Energy Act of 1954, as amended, the Department of Energy has regulatory authority for the disposal of defense-related low-level radioactive waste at DOE sites. The disposal of decontaminated salt solution as saltstone in the SDF falls under this authority. DOE Manual 435.1-1 requires that DOE low-level waste disposal facilities be designed, operated, maintained and closed so that a reasonable expectation exists that DOE performance objectives will be met, including a future all-pathways dose to member of the public of no more than 25 mrem per year total effective dose equivalent.

DOE Manual 435.1-1 also requires performance assessments (PAs), PA maintenance, composite analyses (CA) and CA maintenance. In accordance with DOE Manual 435.1-1 and DOE guidance, PAs must demonstrate reasonable expectation of compliance with the performance objectives for a period of 1,000 years following the closure of a DOE low-level waste disposal facility. DOE PAs also must include qualitative assessments beyond 1,000 years to envelope peak dose and to help in the development of risk-informed DOE decisions.

In accordance with DOE requirements for PA maintenance, the 2009 SDF PA was prepared to update previous analysis by incorporating both deterministic and probabilistic modeling and an evaluation of a new vault disposal design. The SDF PA assessed a 40,000-year period after facility closure (which encompassed the 1,000-year compliance period.) Sensitivity and uncertainty analyses using probabilistic modeling were also performed for a 20,000-year period following SDF closure. The SDF PA underwent rigorous review, and independent, in depth review by subject matter experts on DOE's Low-Level Waste Disposal Facility Federal Review Group (LFRG).

In furtherance of DOE's responsibilities to protect human health and safety under the Atomic Energy Act, DOE provided for NRC review the SDF PA in conjunction with NRC's monitoring role under section 3116(b) of the *Ronald W. Reagan National Defense Authorization Act for Fiscal Year 2005.* Section 3116(b) requires that NRC, in coordination with the State of South Carolina, monitor DOE disposal actions taken under 3116(a) -- such as disposal in the SDF -- for the purpose of assessing compliance with the NRC performance objectives in 10 CFR Part 61, Subpart C. In this regard, the NRC performance objectives and the DOE performance objectives and requirements generally mirror each other, except that DOE's requirements are more stringent in certain respects and impose additional requirements not found in the NRC performance objectives.[1] Although NRC and DOE sometimes refer to the SDF PA as a 3116 "compliance demonstration", nothing in section 3116(b) requires that DOE prepare a PA or compliance demonstration. Similarly, section 3116(b) does not mandate that DOE revise its PA, conduct additional experiments and model support activities, or provide additional basis for model assumptions and PA conclusions. Nor does Section 3116 provide for NRC licensing. Although certain statements in the TER and Letter of Concern may suggest licensing or regulatory authority not included within 3116(b), DOE interprets such statements in the context of section 3116(b) and the confines of NRC's monitoring role.[2] Against this backdrop, DOE has fully considered and identified the path forward to address the NRC observations concerning the SDF PA.

In accordance with DOE Manual 435.1-1 and internal DOE guidance, DOE has also prepared a Disposal Authorization Statement (DAS) for the SDF, which specifies the limits and conditions for continued operation of the SDF using the new disposal cell design. That Disposal Authorization Statement[3] is premised on a full review of the SDF PA, the composite analysis

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[1] See e.g., DOE Manual 435.1-1, Chapter IV-P. and 10 CFR Part 835.

[2] A few statements in the TER also appear to address criteria under Section 3116(a), rather than the more limited monitoring scope of Section 3116(b) to assess compliance with the performance objectives in 10 CFR Part 61, Subpart C. See e.g., TER at page 166 ("Evaluation of practicality of additional Tc removal").

[3] The May 21, 2012 Disposal Authorization Statement for the Savannah River Site Saltstone Disposal Facility (Memorandum from Gilbertson to Spears) and the May 22, 2012 Disposal Authorization Statement for the Savannah River Site Saltstone Disposal Facility (contractor direction letter from Folk to Olsen) were made available

(CA), PA and CA maintenance, LFRG review, the preliminary closure plan, the monitoring plan, the NRC Requests for Additional Information (RAIs), the DOE responses to the RAIs, the SDF TER and additional factors[4]. The Disposal Authorization Statement letter of transmittal also includes the following direction:

> *This DAS is being issued under DOE M 435.1-1. In parallel, DOE will respond to NRC's April 30, 2012, Letter of Concern and "Technical Evaluation Report for the 2009 Performance Assessment from the Saltstone Facility at the Savannah River Site", issued under section 3116(b) of the Ronald W. Reagan National Defense Authorization Act for Fiscal Year 2005. That response will be developed prior to disposal of waste in the new vaults at SDF, and will include additional information and a sensitivity analysis that addresses the NRC comments and confirms that the all-pathways dose to the public will not exceed the performance objective at 10 CFR 61.41.*

In accordance with the DAS letter of transmittal, this document, the June 13, 2012 letter (Spears to Camper) and the July 12, 2012 letter (Spears to Satorius, with the attached sensitivity analysis and refined inventory) have been provided to NRC prior to disposal of waste in the new SDF vaults, to address the SDF TER and Letter of Concern.

SDF TER and Letter of Concern

In Table 1 of the SDF TER, the NRC describes conclusions as to reasonable assurance for each of the four 10 CFR 61, Subpart C performance objectives. The NRC has reasonable assurance as to three of those 10 CFR 61 subpart C performance objectives: 10 CFR 61.42- 44. Concerning the 10 CFR §61.41 performance objective for protection of the general population from releases of radioactivity, the NRC concludes:

> *Based on the results of the NRC's review, the NRC staff does not have reasonable assurance that DOE's disposal actions at the SDF meet this performance objective.*

NRC also refers to these conclusions in the first paragraph of the Letter of Concern:

> *Specifically, the NRC staff has reviewed DOE's proposed action and concluded that the performance objective in §61.41 for protection of the general population from releases may*

to the NRC and the public immediately thereafter on the following website: [http://www.em.doe.gov/stakepages/wmdi_swd_orig.aspx?PAGEID=WMDI].

[4] Although the DAS considered both rounds of NRC's RAIs, DOE's responses to those RAIs and the SDF TER, this approach is not required by DOE Manual 435.1-1 or associated DOE guidance and should not be viewed as precedence for future Disposal Authorization Statements in other circumstances.

> *be exceeded by DOE's current proposed disposal activities for salt waste. Although the NRC staff cannot conclude that the performance objective in §61.41 is met, the potential dose to an off-site member of the public from DOE's disposal actions is still expected to be relatively low (i.e., approximately 1 mSv/yr [100 mrem/yr], the public dose limit in §20.1301).*

The NRC further states in the third paragraph on page 2 of the Letter of Concern:

> *The staff expects that any exceedance of the §61.41 limit would occur many years after site closure but finds that DOE has not provided a sufficient basis for DOE's conclusion that any exceedances would occur beyond 10,000 years. In accordance with NUREG-1854 ... the time for which the 0.25 mSv/yr (25 mrem/yr) dose limit in §61.41 must be met is generally 10,000 years.*

The cited document, NUREG-1854, *NRC Staff Guidance for Activities Related to U.S. Department of Energy Waste Determinations*, is a "Draft Final Report for Interim Use" that was published in August 2007 under the signature of the Director, Division of Waste Management and Environmental Protection.

The document states:

> *This NRC Staff Guidance Document provides direction to the NRC staff and **does not set forth regulatory requirements for NRC nor DOE, and compliance with this review plan is not required.*** [emphasis added]

DOE Manual 435.1-1 has established a requirement that compliance with performance objectives, including a future all-pathways dose to member of the public of no more than 25 mrem per year total effective dose equivalent, must be demonstrated for a period of 1,000 years following the closure of a low-level waste disposal facility. Section IV.P.(2) of the Manual states:

> *A site-specific radiological performance assessment shall be prepared and maintained for DOE low-level waste disposed of after September 26, 1988. The performance assessment shall include calculations for a 1,000 year period[5] after closure of potential doses to representative future members of the public and potential releases from the facility to provide a reasonable expectation that the performance objectives identified in this Chapter are not exceeded as a result of operation and closure of this facility.*

[5] DOE Guide 435.1-1 specifies "Longer times of assessment are not used to assess compliance because of the inherently large uncertainties of extrapolating such calculations over long time frames."

DOE uses a series of deterministic and probabilistic cases that vary key temporal parameters up to tens of thousands of years to inform disposal design, operational protocols, waste acceptance criteria, and to provide a "reasonable expectation" (akin to "reasonable assurance") that performance objectives will be met and that the risks associated with disposal actions to future generations will be minimal. The *Ronald W. Reagan National Defense Authorization Act (NDAA) for Fiscal Year 2005*, Section 3116(b) does not require a compliance demonstration by DOE. Specifically, there is no requirement in Section 3116(b) for DOE to demonstrate reasonable assurance that performance objectives will not be exceeded for 10,000 years following disposal facility closure, although the SDF PA assessed a 40,000-year period after facility closure (which encompassed DOE's 1,000-year compliance period), and included probabilistic sensitivity and uncertainty analyses for a 20,000-year period.

In the second paragraph on page 3 of the Letter of Concern, NRC states:

> *The NRC staff is, however, concerned that (i) information collected during the monitoring period (e.g., hydraulic conductivity measurements, technetium sorption measurements) does not support DOE's compliance demonstration and (ii) sufficient information has not been provided to support many key modeling assumptions relied on for performance (items 2 and 3 above).*

On July 12, 2012, DOE provided NRC a sensitivity analysis to address NRC's above stated concerns related to long-term risks from SDF operations through approximately fiscal year 2015. This sensitivity analysis was based on updated disposal concentrations of technetium (Tc) in Saltstone Disposal Units (SDUs) 2, 3, and 5 (*Projected Technetium-99 Inventory in Saltstone Disposal Facility Units 2, 3, and 5*, SRR-CWDA-2012-00095) which refined the estimated concentrations of Tc provided in the SDF PA. The *Sensitivity Analysis for Disposal Operations into Saltstone Disposal Facility Vault 1, Vault 4, and SDUs 2, 3 and 5*, SRR-CWDA-201200103, provides additional assurance that, even using a non-mechanistic analysis of degraded system performance, solid waste disposal actions taken in the immediate future at SDF will not exceed the §61.41 dose limits for the 10,000 years after SDF closure used in internal NRC staff guidance. Furthermore, this sensitivity analysis utilized a revised GoldSim model DOE provided to NRC on June 13, 2012 which is expected by DOE to address a number of the quality assurance issues raised by NRC in the SDF TER (at pages 20-21, and 162-163). Additionally, NRC raised concerns related to treatment of technetium retention in the disposal cell floors (at pages 190-191). The provided sensitivity analysis also addresses this issue since any changes that lead to an earlier peak dose timing from technetium (i.e., assumed cracked floor) would likely decrease the magnitude of such peak. During the period of time when these disposal cells are being filled (estimated to be through fiscal year 2015), DOE will continue to work with the NRC to resolve outstanding NRC technical uncertainties for all planned disposal operations at SDF as described under DOE Path Forward section of this document. Attachment 1 also describes these longer-term activities.

DOE Manual 435.1-1, *Radioactive Waste Management Manual*, outlines the comprehensive program used by DOE to maintain PAs. The program is in place to evaluate changes (e.g., results of ongoing research projects, new information, changing facility conditions) that could affect the inputs, results, or conclusions of a DOE PA such as the SDF PA. The program requires that PAs be formally reviewed on an annual basis and revised when changes in radionuclide inventories or facility design are identified or new information on key parameters becomes available through continued research and study. Any revised PA would be made available to the NRC and State of South Carolina.

Consistent with the requirements of DOE Manual 435.1-1, the foundation of the SDF assessment is the Base Case model, a deterministic analysis of post-SDF closure that utilizes the best-available, most probable and defensible values for the parameters within the SDF PORFLOW model that were thoughtfully selected by examining specific research and scientific studies, applicable analogs, and most probable conditions based on reasonable judgment. Specifically, these assumptions are not meant to be a collection of bounding values that ensure that the highly conservative performance objective could never be exceeded, but instead are intended to provide a reasonable representation of the system over time for the purposes of making rational risk assessments related to the future impacts of disposing of known quantities of low-level radioactive waste today. This deterministic analysis produces a single discrete value at each point of assessment that, in turn, can be compared directly to the 10 CFR §61.41 performance objective of 25 mrem/year peak dose.

Understanding of the SDF PA results, and thus the associated risks to future generations, is further enhanced through an extensive series of uncertainty analyses and sensitivity analyses. As a hybrid approach, the deterministic Base Case model is accompanied by the probabilistic model and deterministic alternative modeling cases, which are provided as tools to inform on uncertainty associated with the Base Case as a whole. These additional models employed assumptions to assess the effects of deviations from the Base Case assumptions. The fact that Base Case values have uncertainty associated with them does not *a priori* make them incorrect or any less probable.

While there is uncertainty surrounding individual modeling parameters, using bounding or conservative values for every assumption to address uncertainty results in an unrealistic assessment of the system and undermines the intent of the performance-based, risk-informed decision making. The application of the hybrid approach to PA development (i.e., including a probabilistic model and deterministic alternative modeling cases) allows alternate assumptions to be modeled, improving overall understanding of the SDF system. Reasonable expectation of compliance with performance objectives is based on all results evaluated in the SDF PA including the Base Case together with assessments of the uncertainty related to the Base Case assumptions to evaluate alternative potential system performance. DOE's PA maintenance and research efforts focus on improving model support and reducing uncertainty and future risk.

This approach facilitates risk reduction efforts through waste processing and stabilization at the Saltstone Facilities today, while reducing uncertainty and potential risk thousands of years in the future.

The DOE is committed to reducing risk in the interest of protecting the public, site workers, and the environment in all actions, including disposal at the SDF.

Clarification of NRC Statements

On page xvii of the SDF TER, the NRC states:

> *If, in the future, DOE determines it is necessary to revise the assumptions, analysis, design, or waste management approach related to any aspects of the disposal strategy at the SDF in a way that may affect DOE's compliance with the 10 CFR 61 performance objectives, DOE should provide details of these changes to the NRC once approved by the sites regulatory body (South Carolina Department of Health and Environmental Control).*

As stated previously, disposal actions taken by DOE are governed by DOE Order 435.1, *Radioactive Waste Management*, and its associated Manual and Guide, which ensures that all DOE radioactive waste is managed in a manner that is protective of worker and public health and safety, and the environment. The South Carolina Department of Health and Environmental Control (SCDHEC) permits the SDF as a Solid Waste Landfill, and regulates it as such. DOE PAs are performed in accordance with DOE Manual 435.1-1 and are not subject to SCDHEC or NRC approval. Although not approved by these agencies, the PA is provided by DOE to these agencies for their review and information to facilitate their independent decisions. DOE also provides PAs to the public for their information and comment for DOE consideration during DOE's decision making processes.

Additionally, the NRC states on page 3 of the Letter of Concern that the letter will be available electronically:

> *In accordance with §2.390 of the NRC's* "Rules of Practice for Domestic Licensing Proceedings and Issuance of Orders," *a copy of this letter will be available electronically for public inspection in the NRC Public Document Room or using its ADAMS accession number ML120650576).*

DOE wishes to clarify that, although DOE has no issue with the electronic publication of this information, use of this reference is not appropriate as DOE is not an NRC licensee.

NRC states on page 199 of the SDF TER:

> *Furthermore, because the staff expects that any exceedance of the §61.41 limit would occur long after site closure, DOE may be able to develop additional information or take mitigative actions in the short term (e.g., add a strong chemical reducing agent to the*

saltstone formula and improve the quality assurance for saltstone grout) that could provide reasonable assurance that salt waste disposal at the SDF meets the 10 CFR 61 Subpart C performance objectives.

Investigating alternative chemical reducing agents for use in the saltstone grout formula **will be captured in the *Savannah River Site Liquid Waste Facilities Performance Assessment Maintenance Program - FY2013 Implementation Plan* and will be evaluated as** part of PA maintenance under DOE Manual 435.1 -1. See also Attachment 1, A1 -11, Waste Form Chemical Performance.

DOE Path Forward

Increasing model support and reducing uncertainty requires significant research and development related to the properties of interest, along with the diversion of significant funding from other current risk-reduction activities. DOE, as discussed previously, performs such PA development and maintenance according to DOE Manual 435.1-1. To that end, DOE continues to conduct various PA maintenance efforts related to reducing the uncertainty in key areas of the model, including analysis of properties of the actual saltstone waste form, as described in Attachment 1. This significant effort should reduce uncertainty as well as inform processing constraints required to ensure that the waste form performs as modeled.

Attachment 1 describes longer-term activities that will address these concerns as disposal actions continue. This response to the SDF TER factors includes current PA maintenance activities that are currently in progress to address the factors, refers to ongoing monitoring activities and information transfers between DOE and the NRC relevant to the factors, and commits to considering the factors as part of ongoing maintenance and monitoring.

Consistent with the DOE PA maintenance program previously described, DOE will consider NRC's SDF TER when performing new modeling, incorporating any available information described in Attachment 1 for all planned SDF operations. DOE would like to engage in technical discussions with NRC staff later this year prior to perforating the new modeling activities. DOE anticipates completing the new modeling late next calendar year. DOE intends to provide the new information to NRC in advance of additional disposal operations (i.e., SDU 6 and subsequent units). Please note the availability of resources (funds, personnel, equipment, facilities, etc.) and prioritization of risk-reduction related activities could impact upon anticipated scheduled completion dates described above, in Attachment 1, or the *Savannah River Site Liquid Waste Facilities Performance Assessment Maintenance Program — FY2012 Implementation Plan.*

Description of Attachments

Attachment 1 and Attachment 2

Key Issues and Associated Path Forward for the NRC's Technical Evaluation Report

The matrices contained in Attachment 1 and Attachment 2 of this document correlates each factor from the SDF TER Tables A-1 and A-2, respectively, with DOE's current maintenance activities and planned path forward for each factor. The first column provides the factor number ("A1-#" for Table A-1 factors and "A2-#" for Table A-2 factors). This designation was not assigned by the NRC and has been included simply as a way to identify the factor to support discussions. The second, third, and fourth columns provide information directly from SDF TER Table A-1 and SDF TER Table A-2. (Direct quotes from the TER are italicized in the matrix.) The fifth column provides information on applicable current DOE Manual 435.1-1 PA maintenance activities from the *Savannah River Site Liquid Waste Facilities Performance Assessment Maintenance Program — FY2012 Implementation Plan*, SRR-CWDA-2012-00020, as well as additional information on DOE's proposed path forward. The sixth column provides rationale for the path forward, and the final column provides documentation planned to be issued that will be relevant to the factors provided in the SDF TER.

References

10 CFR 61, *Licensing Requirements for Land Disposal of Radioactive Waste*, U.S. Nuclear Regulatory Commission, Washington DC, January 5, 2010.

DOE Guide 435.1-1, *Implementation Guide for use with DOE M 435.1-1*, U.S. Department of Energy, Washington DC, July 9, 1999.

DOE Manual 435.1-1, *Radioactive Waste Management Manual*, U.S. Department of Energy, Washington DC, June 19, 2001.

DOE Order 435.1 Chg 1, *Radioactive Waste Management*, U.S. Department of Energy, Washington DC, August 28, 2001.

ML120650576, Satorius, Mark, *Letter of Concern (Type IV) Regarding U.S. Department of Energy Disposal Activities at the Savannah River Site Saltstone Disposal Facility Site,* U.S. Nuclear Regulatory Commission, Washington DC, April 30, 2012.

ML121020140, *Technical Evaluation Report For the Revised Performance Assessment for the Saltstone Disposal Facility at the Savannah River Site*, U.S. Nuclear Regulatory Commission, Washington DC, April 30, 2012.

NDAA_3116, Public Law 108-375, *Ronald W. Reagan National Defense Authorization Act for Fiscal Year 2005*, Section 3116, Defense Site Acceleration Completion.

NUREG-1854, *NRC Staff Guidance for Activities Related to U.S. Department of Energy Waste Determinations, Draft Final Report for Interim Use*, U.S. Nuclear Regulatory Commission, Washington DC, August 31, 2007.

SRR-CWDA-2009-00017, *Performance Assessment for the Saltstone Disposal Facility at the Savannah River Site,* Savannah River Site, Aiken, SC, Rev. 0, October 29, 2009.

SRR-CWDA-2011-00044, *Comment Response Matrix for Nuclear Regulatory Commission RAI2009-02 Second Request for Additional Information (RAI) on the Saltstone Disposal Facility Performance Assessment (SRR-CWDA-2009-00017, Revision 0, dated October 29, 2009)*, Aiken, SC, Rev. 1, August 2011.

SRR-CWDA-2012-00020, *Savannah River Site Liquid Waste Facilities Performance Assessment Maintenance Program – FY2012 Implementation Plan*, Aiken, SC, Rev. 0, March 2012.

SRR-CWDA-2012-00095, *Projected Technetium-99 Inventory in Saltstone Disposal Facility Units 2, 3, and 5*, Aiken, SC, Rev. 0, July 2012.

SRR-CWDA-2012-00103, *Sensitivity Analysis for Disposal Operations into Saltstone Disposal Facility Vault 1, Vault 4, and SDUs 2, 3 and 5*, Aiken, SC, Rev. 0, June 2012.

Attachment 1: Items Identified in NRC's Technical Evaluation Report Table A-1

#	Topic	Factor	NRC Basis	Path Forward / Current Maintenance Activities	Technical Justification	Documentation
A1-1	*Inventory*	*NRC will monitor the inventory in Vault 1, Vault 4, and in each FDC in comparison to the values in Table 2.2-1, with the exception of Ra-226 and Th-230. NRC will monitor the inventory of Ra-226 and Th-230 as compared to the values in Table 2.2-2.*	*The distribution of inventory among the disposal units will be important in determining potential doses to both an offsite member of the public and an inadvertent intruder. Because a single FDC can dominate the dose to an inadvertent intruder, and because the projected intruder dose was a significant fraction of the 5 mSv/yr (500 mrem/yr) limit, each FDC inventory must be consistent with PA assumptions (2009 PA) for NRC to retain reasonable assurance disposal meets the performance objective for intruder protection. Because a small number of FDCs can dominate the dose to an off-site member of the public, the inventory in individual FDCs also is relevant to protection of the general public. Although certain disposal units dominate the dose projected in DOE's updated performance assessment, the location of the peak dose and degree of plume overlap can change with changing assumptions about far-field transport.*	• DOE will continue to issue a quarterly report detailing the composition and volume of the decontaminated salt solution and grout disposed of in SDF during that quarter. This information is provided to the public via a website. (http://sro.srs.gov/saltstone.htm) • DOE will continue to issue an Annual SDF PA Review detailing disposal actions taken during the year that will include the current inventory of the SDF on a radionuclide-by-radionuclide basis.	This is an ongoing monitoring activity conducted by DOE as part of DOE's SDF PA Maintenance Program under DOE Manual 435.1-1. DOE will continue to make this information available to the NRC and SCDHEC upon request.	• Quarterly reports will continue to be issued and website data will be updated until SWPF begins operations. • The SDF PA Annual Review document is developed annually by the DOE Contractor (currently Savannah River Remediation LLC) and submitted to DOE for review and approval per the requirements of DOE Manual 435.1-1.

#	Topic	Factor	NRC Basis	Path Forward / Current Maintenance Activities	Technical Justification	Documentation
A1-2	*Inventory*	*NRC will monitor the methods DOE uses to assess radionuclide inventories.*	*Because of the considerable uncertainty in inventory estimates and the importance of radionuclide inventory to dose to an off-site member of the public as well as an inadvertent intruder, NRC will monitor the methods DOE uses to assess radionuclide inventories. NRC will focus on radionuclides that are currently identified as risk significant as well as relevant ancestors (e.g., Tc-99, Ra-226, Th-230, I-129) but also will consider radionuclides that could become more risk significant if the inventory increases significantly or if modeling assumptions change (e.g., Se-79). In particular, NRC will monitor assumptions about the inventory of Th-230 in tanks that are known to have Th-230 bearing waste and any methods used to estimate the concentration of Th-230 when Th-230 is below DOE's detection limit.*	DOE has tracked radionuclide inventories in the past through engineering calculations which are posted at http://sro.srs.gov/saltstone.htm using conservative methodologies. As described in SRR-CWDA-2012-00002, all methodologies have been reviewed and updated to remove conservatism and use available measured values. DOE is currently developing software that will allow for online tracking of disposal unit radiological inventories.	This is an ongoing monitoring activity conducted by DOE as part of DOE's SDF PA Maintenance Program under DOE Manual 435.1-1. DOE will continue to make SDF inventory information available to the NRC and SCDHEC upon request.	DOE recently issued: • SRR-CWDA-2012-00002, which updates the SDU 1 and 4 inventories and identifies the revised methodologies used to determine the SDF inventory as of 9/30/2011. • SRR-CWDA-2012-00067, which updates the SDF inventory through 3/31/2012.
A1-3	*Infiltration and Erosion Control*	*NRC will monitor updates to DOE's assessment of the effects of settlement on the long-term performance of the composite layer in the closure cap and overlying the FDC roofs.*	*Recent studies predict greater settlement in the SDF than addressed by DOE in the PA. Because settlement has the potential to disrupt the composite layer in the closure cap and the lateral drainage layers that play a key role in diverting water around the FDCs, NRC will monitor updated DOE evaluations of the expected effects of settlement on composite layers in the closure cap and overlying the FDC roofs.*	DOE has not finalized the design of the closure cap at this time. DOE expects to design the cap at the time of closure in order to use the most current and appropriate cap design. Since the Saltstone Disposal Facility closure cap final design and installation is at least 20 years in the future, testing and research work performed to support other closure sites will be used to inform the final design including information relative to settlement of composite layers. . Consequently, activities in this area are not anticipated in the short-term.	Closure cap installation is far in the future and therefore will be addressed in the future under DOE's SDF PA Maintenance program.	• This activity will be evaluated as part of PA maintenance under DOE Manual 435.1-1. The information will be shared with the NRC and SCDHEC as final decisions are developed.

#	Topic	Factor	NRC Basis	Path Forward / Current Maintenance Activities	Technical Justification	Documentation
A1-4	*Infiltration and Erosion Control*	*NRC will monitor issues related to long-term closure cap performance.*	*DOE expects the SDF closure cap to limit infiltration and erosion for thousands of years after site closure. Because the cap design will be made final closer to the time of site closure, NRC will monitor whether any design changes or specific aspects of the cap implementation (e.g., sources of erosion barrier source material) are expected to affect the predicted cap performance assumed in the PA. Before closure cap installation, additional information is needed about the potential effects of head build up above the composite layer on slope stability, the potential for gully formation due to the cumulative effects of smaller, more frequent flood events, and the predicted hydraulic conductivity of the foundation layer. Additional issues may be identified as the cap design develops.*	Since the Saltstone Disposal Facility closure cap installation is at least 20 years in the future, testing and research work performed to support other closure sites will be used to inform the ultimate design, including lessons learned and research and development work conducted for closure sites outside of SRS. Targeted activities in this area are not anticipated in the short-term. As the final cap design is developed, DOE will evaluate potential effects, if any, of head buildup, gully formation, and flood events. The closure cap will be designed to ensure the hydraulic conductivity of the foundation layer meets or exceeds required performance.	Closure cap installation is far in the future and therefore will be addressed in the future under the SDF PA Maintenance program.	• This activity will be evaluated as part of PA maintenance under DOE Manual 435.1-1. The information will be shared with the NRC and SCDHEC as final decisions are developed.

#	Topic	Factor	NRC Basis	Path Forward / Current Maintenance Activities	Technical Justification	Documentation
A1-5	*Waste Form Hydraulic Performance*	*NRC will monitor the measured values of hydraulic conductivity in field-emplaced saltstone samples, values from other representative studies, and the appropriateness of any new sampling technique.*	*The hydraulic performance of field-emplaced saltstone is critical to adequate SDF performance. Recently DOE has measured saturated hydraulic conductivity values in saltstone in a range greater than assumed in the PA. Because of DOE concerns about the sampling technique, DOE is developing new methods to sample field-emplaced saltstone. This issue previously has been tracked as part of Open Issue 2007-1.*	DOE is currently performing the following maintenance activities as described in the Savannah River Site Liquid Waste Facilities Performance Assessment Maintenance Program — FY2012 Implementation Plan (SRR-CWDA-2012-00020): • **PA Property Testing of Saltstone Produced in the SPF Operating Window:** (Section 2.3.1.4) DOE is currently measuring hydraulic conductivity of simulant saltstone with varying compositions to envelope the operating requirements for the facility. • **Hydraulic Properties of Formed Core Samples:** (Section 2.3.1.2) this activity will provide information about the formed core sampling technique that DOE is currently investigating. DOE experienced technical difficulties associated with collecting emplaced saltstone samples which may have impacted the measurement of certain physical properties. DOE continues to explore enhancements to the core sampling technique and will continue to research other emplaced sampling techniques which will be evaluated as part of the SDF PA Maintenance. As part of this overall effort, DOE is currently evaluating the use of an in-situ formed core emplaced sampling process. Early conceptual details of this technique has previously been shared with the NRC during onsite observation visits. DOE has now developed a full-scale prototype and is currently testing the design feasibility for implementation in the field. Testing has identified several technical challenges that must be overcome prior to deployment.	DOE is currently performing SDF PA maintenance activities relevant to this factor. As field-emplaced samples will not be available until a viable field sampling technique such as formed core sampling can be installed in an SDU, DOE will continue to utilize laboratory experiments to provide enhance the currently knowledge base and to develop most probable predictions of the waste form hydraulic data.	• DOE will continue to document the results from the applicable maintenance activities. • This activity will be captured in the Savannah River Site Liquid Waste Facilities Performance Assessment Maintenance Program — FY2013 Implementation Plan and will be evaluated as part of PA maintenance under DOE Manual 435.1-1.

#	Topic	Factor	NRC Basis	Path Forward / Current Maintenance Activities	Technical Justification	Documentation
A1-6	*Waste Form Hydraulic Performance*	*NRC will monitor the potential variability of as emplaced Saltstone properties and DOE's quality assessment program for grout*	*Variations in the composition of saltstone grout produced at the SPF and emplaced in the disposal units (e.g., variations in the water-to-cementitious material ratio, aluminate concentration, presence of admixtures) may affect hydraulic properties of saltstone grout. Because of the sensitivity of dose predictions to saltstone hydraulic properties, quality assurance for the emplaced saltstone waste form will be important for building reasonable assurance in SDF performance. This factor includes both determining the potential variability in the hydraulic properties due to variations in the saltstone composition and ensuring that factors determined to significantly affect the hydraulic properties are well controlled in the production of saltstone. This factor is related to issues previously tracked as Open Issue 2007-1 and Open Issue 2007-2.*	DOE is currently performing the following maintenance activities as described in SRR-CWDA-2012-00020: • **PA Property Testing of Saltstone Produced in the SPF Operating Window:** (Section 2.3.1.4) DOE is currently measuring hydraulic conductivity of simulant saltstone with varying compositions to envelope operating requirements for the facility. This work will provide correlation of key physical and chemical properties between lab-produced samples and field emplaced samples. • **Hydraulic Properties of Formed Core Samples:** (Section 2.3.1.2) this activity will provide a basis for future emplaced sampling activities that will allow for assessments of emplaced saltstone variability. DOE is also evaluating technologies to obtain representative emplaced samples of saltstone (previously discussed). Information from all maintenance efforts will be used to inform operation of the SPF to ensure control of grout quality factors that affect long-term hydraulic properties. Recent upgrades have also been made to the SPF that allow for improved collection of operational data.	DOE is currently performing SDF PA Maintenance activities relevant to this factor. As field-emplaced samples will not be available until a viable field sampling technique such as formed core sampling can be installed in an SDU, DOE will continue laboratory experiments to provide data relating the final saltstone waste form to initial formulation as part of assuring adequate quality control of factors that could affect long-term hydraulic properties.	• DOE will continue to document the results from the applicable maintenance activities. • This activity will be captured in the Savannah River Site Liquid Waste Facilities Performance Assessment Maintenance Program — FY2013 Implementation Plan and will be evaluated as part of PA maintenance under DOE Manual 435.1-1.

#	Topic	Factor	NRC Basis	Path Forward / Current Maintenance Activities	Technical Justification	Documentation
A1-7	*Waste Form Hydraulic Performance*	*NRC will monitor the applicability of data on the hydraulic properties measured using laboratory-produced samples to ensure that it adequately reflects the properties of field emplaced saltstone.*	*Because laboratory-produced samples have been used as a basis for the value of the saltstone saturated hydraulic conductivity and diffusivity used in the PA, the applicability of the measurements made using laboratory-produced samples to field conditions could affect dose predictions. For example, it is important to consider the potential effects of scale, temperature, the presence of admixtures, and reducing conditions in the lab sample when estimating properties of as-emplaced saltstone from laboratory-produced samples.*	DOE is currently performing the following maintenance activities as described in SRR-CWDA-2012-00020: • **PA Property Testing of Saltstone Produced in the SPF Operating Window:** (Section 2.3.1.4) DOE is currently measuring hydraulic conductivity of simulant saltstone with varying compositions and cure temperatures to envelope operating requirements for the facility. Some of the compositions tested include admixtures to better understand their impact. This work will provide information for correlation between lab-produced sample measurements and field emplaced samples. • **Hydraulic Properties of Formed Core Samples:** (Section 2.3.1.2) this activity will provide a basis for future emplaced sampling activities that will allow for assessments of emplaced saltstone physical and chemical properties.	DOE is currently performing SDF PA Maintenance activities relevant to this factor. As field-emplaced samples will not be available for comparison to laboratory samples until a viable field sampling technique such as formed core sampling can be installed in an SDU, DOE will continue laboratory experiments to provide additional hydraulic data.	• DOE will document the results from the applicable maintenance activities. • This activity, including consideration of scale, temperature, admixtures and reducing conditions on waste form properties, will be captured in the Savannah River Site Liquid Waste Facilities Performance Assessment Maintenance Program — FY2013 Implementation Plan and will be considered as part of PA maintenance under DOE Manual 435.1-1.

#	Topic	Factor	NRC Basis	Path Forward / Current Maintenance Activities	Technical Justification	Documentation
A1-8	*Waste Form Hydraulic Performance*	*NRC will monitor the effect of the curing temperature profile on the hydraulic properties of as-emplaced saltstone.*	*DOE studies have demonstrated the potential importance of the curing temperature profile to the saturated hydraulic conductivity of saltstone. Saltstone hydraulic conductivity, in turn, significantly affects dose predictions. It is therefore important to understand the potential effect of curing temperature on the hydraulic properties and to verify that the cure temperatures in the saltstone monolith will not result in a waste form that has higher hydraulic conductivities.*	DOE is currently performing the following maintenance activities as described in SRR-CWDA-2012-00020: • **PA Property Testing of Saltstone Produced in the SPF Operating Window:** (Section 2.3.1.4) DOE is currently measuring hydraulic conductivity of simulant saltstone with varying compositions to envelope operating requirements for the facility. This research is focused on maintaining samples in an atmosphere of high relative humidity and curing them under actual temperature profiles as measured in two cells of SDU 4. These measured profiles represent "typical" temperature profiles. This work will also provide correlation between lab-produced sample measurements and field emplaced samples. Information from these efforts will be used to inform SPF facility operations and SDF grout emplacement strategies.	DOE is currently performing SDF PA maintenance activities relevant to this factor. As field-emplaced samples will not be available until a viable field sampling technique such as formed core sampling can be installed in an SDU, DOE will continue bench scale experiments to correlate cure temperature information and hydraulic properties.	• DOE will document the results from the applicable maintenance activities. • This activity will be captured in the Savannah River Site Liquid Waste Facilities Performance Assessment Maintenance Program — FY2013 Implementation Plan and will be evaluated as part of PA maintenance under DOE Manual 435.1-1.

#	Topic	Factor	NRC Basis	Path Forward / Current Maintenance Activities	Technical Justification	Documentation
A1-9	*Waste Form Physical Degradation*	*NRC will monitor the development of model support for assumptions about saltstone fracturing.*	*DOE evaluations of alternative cases and NRC independent analyses indicate the sensitivity of dose projections to the assumed rate and extent of saltstone fracturing because of effects on saltstone oxidation as well as water flow through the disposal system.*	DOE is currently performing the following maintenance activities as described in SRR-CWDA-2012-00020: • **Cracking and Transport Literature Review:** (Section 2.3.3.3) DOE is currently performing research on the mechanisms of crack formation and propagation in cementitious materials, which will provide additional information to inform future modeling efforts. Other research in this area includes investigation of oxidation rates (Section 2.3.3.5), degradation mechanisms (Sections 2.3.3.1, 2.3.3.2, and 2.3.3.7), and measurements of fractured cementitious material properties (Section 2.3.3.4).	DOE is currently performing several SDF PA maintenance activities relevant to this factor. Saltstone degradation is of high interest to DOE, and will continue to be an item of focus in the SDF PA maintenance program.	• DOE will document the results from the applicable maintenance activities. • This activity will be captured in the Savannah River Site Liquid Waste Facilities Performance Assessment Maintenance Program — FY2013 Implementation Plan and will be evaluated as part of PA maintenance under DOE Manual 435.1-1.

#	Topic	Factor	NRC Basis	Path Forward / Current Maintenance Activities	Technical Justification	Documentation
A1-10	*Waste Form Chemical Performance*	*NRC will monitor whether measured radionuclide release from samples of field-emplaced saltstone are consistent with assumptions used in the PA.*	*Because of the importance of radionuclide release rates to the projected dose, it will be important to determine whether the release of radionuclides from field-emplaced saltstone is consistent with assumptions in the PA. This issue previously has been tracked as part of Open Issue 2007-2. Additionally, leaching experiments conducted to date have reflected the bulk constituents of saltstone and simulated waste, but have not included admixtures used in the production of saltstone at the SPF. Because certain admixtures, such as the anti-foam agent Tributyl Phosphate (TBP) may form chemical complexes with radionuclides that limit radionuclide sorption or increase solubility, it will be important to determine whether radionuclide leaching from samples containing these admixtures is consistent with assumptions in the PA.*	DOE is currently performing the following maintenance activities as described in SRR-CWDA-2012-00020: • **PA Property Testing of Saltstone Produced in the SPF Operating Window:** (Section 2.3.1.4) DOE is currently measuring hydraulic conductivity of simulant saltstone with varying compositions and cure temperatures to envelope operating requirements for the facility. Some of the compositions tested include admixtures to better understand their impact. This work will provide information for correlation between lab-produced sample measurements and field emplaced samples. • **Long-term Radiological Lysimeter Program:** (Section 2.3.3.6) DOE is currently fabricating a lysimeter with spiked saltstone simulants as well as soils to be placed in field conditions and monitored over the course of ten years. This monitoring will include measurement of radionuclide release from the samples over time to inform the current waste release models. Information gathered from these efforts will be used to inform future SPF operations, including consideration of admixture addition effects on saltstone properties including sorption and solubility.	DOE is currently performing SDF PA maintenance activities relevant to this factor. Through the DOE Manual 435.1-1 PA Maintenance Program, DOE, as appropriate, will continue to enhance waste release information considering site-specific information and additional experimentation.	• DOE will document the results from the applicable maintenance activities. • This activity will be captured in the Savannah River Site Liquid Waste Facilities Performance Assessment Maintenance Program — FY2013 Implementation Plan and will be evaluated as part of PA maintenance under DOE Manual 435.1-1.

#	Topic	Factor	NRC Basis	Path Forward / Current Maintenance Activities	Technical Justification	Documentation
A1-11	*Waste Form Chemical Performance*	*NRC will monitor the development of a robust demonstration that saltstone will chemically reduce Tc(VII) to Tc(IV) to the extent assumed in DOE's PA model under the range of conditions to which saltstone is expected to be subjected during the compliance period.*	*Studies DOE has relied on to demonstrate Tc retention in saltstone have included experimental artifacts [i.e., the presence of sodium thiosulfate or $H_2(g)$] that have made it difficult to interpret the results of these experiments. Based on these experiments, it is unclear whether saltstone itself can reduce Tc and maintain Tc in a reduced state. Furthermore, recent DOE studies have shown the sensitivity of Tc retention in saltstone to trace quantities of oxygen. The peak dose to an off-site member of the public and the inadvertent intruder is sensitive to Tc release, which in turn is sensitive to Tc redox state. For these reasons, there must be a robust demonstration of the ability of saltstone to reduce Tc and maintain Tc in a reduced state in environmental conditions similar to the expected environmental conditions of the emplaced waste form will be important to demonstrating there is reasonable assurance that SDF disposal meets the performance objectives for protection of a member of the general population. The reduction of Tc in saltstone previously has been tracked as Open Issue 2009-1.*	DOE is continuing to perform the series of studies reviewed with the NRC that are designed to specifically address Issue 2009-1 concerning Tc reduction in the saltstone waste form over time. DOE is currently performing the following maintenance activities as described in SRR-CWDA-2012-00020: • **Technetium K_d Sorption Testing:** (Section 2.3.1.1) This study is a batch experiment to determine the K_d of Tc under reducing conditions, which is a continuation and expansion of the testing reported in SRNL-STI-2011-00716. • **Technetium K_d Column Studies:** (Section 2.3.1.5) This is a column study that will provide K_d information over time as well as information about pH and Eh transitions as liquid moves through a column of waste material. • **Oxidation Rate Analytical Method Development:** (Section 2.3.3.5) This study is an investigation of the oxidation front in saltstone, establishing how quickly it moves and what the oxidation front looks like. This activity will provide additional information on the release mechanism of technetium from saltstone over time.	DOE is currently performing several SDF PA maintenance activities relevant to this factor. Current activities focus on (i) providing evidence of the extent that Tc is reduced within the saltstone monolith,, (ii) providing evidence that the saltstone waste form itself can reduce Tc, and (iii) developing oxidation profiles and rate information. This information, along with future information from continued maintenance activities and anticipated future emplaced sampling, will further inform DOE's understanding of oxidation and release of Tc from emplaced saltstone over time.	• DOE will document the results from the applicable maintenance activities. • This activity will be captured in the Savannah River Site Liquid Waste Facilities Performance Assessment Maintenance Program — FY2013 Implementation Plan and will be evaluated as part of PA maintenance under DOE Manual 435.1-1.

#	Topic	Factor	NRC Basis	Path Forward / Current Maintenance Activities	Technical Justification	Documentation
A1-12	*Waste Form Chemical Performance*	*NRC staff will monitor the development of additional information regarding the initial reducing capacity of saltstone as compared to the value assumed in the PA (i.e., 0.82 meq e^-/g) and the expected evolution of redox conditions over time.*	*The DOE Case K model and NRC sensitivity analyses demonstrate the importance of saltstone reducing capacity to the projected Tc release rate. However, it is unclear why the measured value of the specific reducing capacity of saltstone, which contains only 25% blast furnace slag, is equivalent to the measured reducing capacity of pure blast furnace slag. Additionally, there is uncertainty in the E_h transition times assumed in the PA, which affects the predicted release of redox sensitive radionuclides other than Tc (because they were modeled with a pore-volume step-change release model).*	DOE is currently performing the following maintenance activities as described in SRR-CWDA-2012-00020: • **Multidimensional Simulation of pH and Eh Evolution in Cementitious Materials:** DOE is currently working to extend Eh/pH simulation capabilities from one-dimensional to two-dimensional. This will allow future modeling to reflect more gradual Eh/pH transitions than a step-change release. DOE will continue to evaluate the reduction capacity of saltstone as part of the SDF PA Maintenance Program.	DOE is currently performing SDF PA maintenance activities relevant to this factor. DOE currently assumes an initial reducing capacity for saltstone consistent with available experimental data. As additional information about reduction capacity and Eh/pH transitions over time becomes available, DOE will evaluate and incorporate it consistent with the required DOE Manual 435.1-1 PA Maintenance Program.	• DOE will document the results from the applicable maintenance activities. • This activity will be captured in the Savannah River Site Liquid Waste Facilities Performance Assessment Maintenance Program — FY2013 Implementation Plan and will be evaluated as part of PA maintenance under DOE Manual 435.1-1.

#	Topic	Factor	NRC Basis	Path Forward / Current Maintenance Activities	Technical Justification	Documentation
A1-13	*Waste Form Chemical Performance*	*NRC will monitor measurements of Ra-226, Se-79, and Sr-90 sorption in or leaching from saltstone.*	*Although the dose from Ra-226 dominates the dose from Case A and most of the DOE sensitivity analyses, DOE relied on measured values of Sr sorption to estimate Ra sorption in oxidizing saltstone in the PA. If Ra-226 continues to make a significant contribution to DOE's projected doses from the SDF, it will be important to reduce the uncertainty in Ra sorption by collecting element-specific information about Ra sorption in and release from saltstone. Additionally, as discussed in Section 2.7, the NRC staff does not believe that there is an adequate basis for the K_d values DOE uses to represent Se or Sr sorption in saltstone. Lower saltstone K_d values could result in greater dose contributions to an off-site member of the public (from Se-79) or an inadvertent intruder (from Sr-90).*	DOE is currently performing the following maintenance activities as described in SRR-CWDA-2012-00020: • **Long-term Radiological Lysimeter Program:** (Section 2.3.3.6) DOE is currently fabricating a lysimeter with saltstone simulants spiked with Sr to be placed in field conditions and monitored over the course of ten years. This monitoring will include measurement of radionuclide release from the samples over time to inform the current waste release models. Current saltstone K_d values are based on site-specific material testing as described in WSRC-STI-2007-00640 and SRNS-STI-2008-00045. As Se and Sr are not dose-significant radionuclides per the SDF PA, priority for addressing this concern is lower than that of higher-risk radionuclides. DOE will consider additional future maintenance activities to address this factor with respect to Ra-226 and Se-79 consistent with their importance to predicting the overall future doses over time.	DOE continues to enhance waste release information through development of site-specific information and additional experimentation.	• DOE will document the results from the applicable maintenance activities. • This activity will be captured in the Savannah River Site Liquid Waste Facilities Performance Assessment Maintenance Program — FY2013 Implementation Plan and will be evaluated as part of PA maintenance under DOE Manual 435.1-1.

#	Topic	Factor	NRC Basis	Path Forward / Current Maintenance Activities	Technical Justification	Documentation
A1-14	*Waste Form Chemical Performance*	*The NRC staff will monitor the development of support for the assumption that short term rinse release of radionuclides from saltstone seen in laboratory experiments will not significantly affect projected peak doses from groundwater pathways at the SDF.*	*Studies of Tc release from saltstone samples often demonstrate an initial relatively rapid release of Tc that is characterized as a "rinse-release" phenomenon and excluded from calculated release rates. If water is excluded from the SDF for extended periods after site closure, this rinse-release, if applicable to as-emplaced saltstone, would not occur until well after the sheet-drain system is grouted and closed.*	DOE is currently performing the following maintenance activities as described in SRR-CWDA-2012-00020: • **Technetium K_d Column Studies:** (Section 2.3.1.5) DOE is currently performing a column study concerning the release of Tc over time, which will also provide information about Eh/pH transitions as well as pore volumes required to release the Tc. This study is a column study where pore water simulant is passed through a column of simulant saltstone and will provide dynamic system information for evaluation. • DOE's long-term lysimeter program (Section 2.3.3.6) will also provide information about release over time of samples subject to actual SRS field conditions. Information from these ongoing efforts will be used to further evaluate the probability of a "rinse release" of Tc from emplaced saltstone. If determined to be probable, the impacts will be considered in future revisions to the SDF PA Conceptual Model.	DOE is currently performing SDF PA Maintenance activities relevant to Tc release from the saltstone matrix. DOE continues to enhance waste release information through development of site-specific information and additional experimentation. As field-emplaced samples become available, additional Tc waste release experiments may be performed.	• DOE will document the results from the applicable maintenance activities. • This activity will be captured in the Savannah River Site Liquid Waste Facilities Performance Assessment Maintenance Program — FY2013 Implementation Plan and will be evaluated as part of PA maintenance under DOE Manual 435.1-1.

#	Topic	Factor	NRC Basis	Path Forward / Current Maintenance Activities	Technical Justification	Documentation
A1-15	*Disposal Unit Performance*	*NRC will monitor the development of information about Ra and Se sorption in disposal unit concrete.*	*Although the dose from Ra-226 dominates the predicted dose in Case A and most of the DOE sensitivity analyses, DOE relied on measured values of Sr sorption as a surrogate for Ra sorption in the PA. If Ra-226 continues to make a significant contribution to DOE's projected does from the SDF, it will be important to reduce the uncertainty in Ra sorption by collecting radionuclide-specific information about Ra sorption in disposal unit concrete. Additionally, the NRC staff does not believe that there is an adequate basis for the K_d value DOE used in the PA to estimate Se sorption in disposal unit concrete.*	Current concrete K_d values are based on site-specific material testing as described in WSRC-STI-2007-00640 and SRNS-STI-2008-00045. As Se and Sr are not dose-significant radionuclides per the SDF PA, priority for addressing this concern is lower than that of higher-risk radionuclides. As part of the overall PA maintenance program, additional site specific testing of important adsorption materials and elements (e.g., Ra) will continue to be tested as appropriate. DOE is currently performing the following maintenance activities as described in SRR-CWDA-2012-00020: • **Long-term Radiological Lysimeter Program:** (Section 2.3.3.6) DOE is currently fabricating a lysimeter with saltstone simulants spiked with Sr to be placed in field conditions and monitored over the course of ten years. This monitoring will include measurement of radionuclide release from the samples over time to inform the current waste release models.	DOE continues to enhance waste release information through development of site-specific information and additional experimentation.	• This activity will be captured in the Savannah River Site Liquid Waste Facilities Performance Assessment Maintenance Program — FY2013 Implementation Plan and will be evaluated as part of PA maintenance under DOE Manual 435.1-1.

#	Topic	Factor	NRC Basis	Path Forward / Current Maintenance Activities	Technical Justification	Documentation
A1-16	*Disposal Unit Performance*	*NRC will monitor the development of information about Tc sorption in disposal unit concrete.*	*NRC analyses of intermediate results from DOE's Case K PORFLOW™ model demonstrate the importance of Tc retention in disposal unit concrete to the timing and magnitude of the dose from fractured saltstone.*	The dual-porosity model was developed by DOE to represent the physical characteristics of a fracture growth model within the disposal unit concrete. As part of the DOE Manual 435.1-1 PA Maintenance Program, DOE will consider the development of additional sensitivity analyses addressing retention of Tc in the disposal unit concrete over time.	DOE is currently performing SDF PA Maintenance activities relevant to this factor. DOE continues to enhance waste release information through development of site-specific information and additional experimentation.	• DOE will document the results from the applicable maintenance activities. • This activity will be captured in the Savannah River Site Liquid Waste Facilities Performance Assessment Maintenance Program — FY2013 Implementation Plan and will be evaluated as part of PA maintenance under DOE Manual 435.1-1.

#	Topic	Factor	NRC Basis	Path Forward / Current Maintenance Activities	Technical Justification	Documentation
A1-17	*Disposal Unit Performance*	*NRC will monitor the development of model support for the performance of the lower lateral drainage layer, which depends on the performance of the disposal unit roofs and the HDPE/GCL layers above the FDCs.*	*In most of DOE's modeled cases, the lower lateral drainage layer above each disposal unit diverts nearly all of the infiltrating water around the disposal units. This modeled diversion of infiltrating water is due to the large difference in the hydraulic conductivity between the lower lateral drainage layer and the disposal unit roofs (for Vaults 1 and 4) and the HDPE/GCL layer (for the FDCs). Because an increase in the amount of infiltrating water will increase the amount of leaching from and the rate of degradation of the waste form, an increase in the amount of infiltrating water would likely result in a higher dose. Therefore, the NRC will monitor model support for the long-term performance of the disposal unit roofs and HDPE/GCL layers overlying the FDCs.*	DOE has not finalized the design of the closure cap at this time. DOE expects to design the closure cap at the time of closure in order to use the most current and appropriate cap design. Since the SDF closure cap installation is at least 20 years in the future, testing and research work performed to support other closure sites will be used including information about the disposal unit roof and HDPE/GCL layer hydraulic conductivities. Consequently, activities in this area are not anticipated in the short-term. In SRR-CWDA-2011-00044, *Comment Response Matrix for Nuclear Regulatory Commission RAI-2009-02 Second Request for Additional Information (RAI) on the Saltstone Disposal Facility Performance Assessment (SRR-CWDA-2009-00017, Revision 0, dated October 29, 2009)*, DOE provides extensive support for the assumptions used in the PA model related to the lower drainage layer. Although DOE recognizes that quantity of infiltrating water over time can significantly impact the timing and magnitude of peak doses, these assumptions represent the most probable performance of this drainage layer over time.	Closure cap installation is far in the future and therefore will be addressed in the future under the SDF PA Maintenance program.	• The Savannah River Site Liquid Waste Facilities Performance Assessment Maintenance Program — FY2012 Implementation Plan currently includes this factor in Section 2.3.3.10.

#	Topic	Factor	NRC Basis	Path Forward / Current Maintenance Activities	Technical Justification	Documentation
A1-18	*Disposal Unit Performance*	*NRC will monitor the development of model support regarding the long-term fracturing of disposal unit concrete.*	*NRC analyses of intermediate results from DOE's Case K PORFLOW™ model demonstrate the importance of Tc retention in disposal unit concrete to the timing and magnitude of the dose from fractured saltstone. Radionuclides that flow through fast-pathways created by fractures in the disposal unit floors or walls are not expected to experience as much sorption as radionuclides moving through an unfractured cementitious matrix.*	DOE is currently performing the following maintenance activities as described in SRR-CWDA-2012-00020: • **Cracking and Transport Literature Review:** (Section 2.3.3.3) DOE is currently performing research on the mechanisms of crack formation and propagation in cementitious materials, which will provide additional information to inform future modeling efforts. • Other research in this area includes investigation of oxidation rates (Section 2.3.3.5), degradation mechanisms (Sections 2.3.3.1, 2.3.3.2, and 2.3.3.7), and measurements of fractured cementitious material properties (Section 2.3.3.4). DOE will continue to evaluate the modeling of Tc retention in disposal unit concrete as part of SDF PA Maintenance.	DOE is currently performing several SDF PA maintenance activities relevant to this factor. As the design and construction of the individual saltstone disposal cells are a very expensive capital cost item, disposal unit degradation and its impact on long-term performance is of high interest to DOE in its design and operation of the SDF and associated disposal cells.	• DOE will document the results from the applicable maintenance activities. • This activity will be captured in the Savannah River Site Liquid Waste Facilities Performance Assessment Maintenance Program — FY2013 Implementation Plan and will be evaluated as part of PA maintenance under DOE Manual 435.1-1.

#	Topic	Factor	NRC Basis	Path Forward / Current Maintenance Activities	Technical Justification	Documentation
A1-19	*Disposal Unit Performance*	*NRC will monitor the development of model support for the long-term physical integrity of non-cementitious materials (e.g., epoxy, and neoprene seals) used in disposal unit joints.*	*There is uncertainty associated with the performance of novel components in the design, as a result of a lack of information on long-term performance of novel components (e.g., epoxy, and neoprene seals). DOE may need to review its experience base with these materials in similar facilities, or, for example, perform accelerated testing to obtain long-term performance data.* *NRC analyses of intermediate results from DOE's Case K PORFLOW™ model demonstrate the importance of Tc retention in disposal unit concrete to the timing and magnitude of the dose from fractured saltstone. If radionuclides flow through fast-pathways created by degradation of joint material instead of through the disposal unit cementitious material, radionuclides may not be effectively retained in the disposal unit concrete.*	DOE will consider additional future maintenance activities such as review of facility knowledge and/or property testing for the non-cementitious material to address this factor consistent with its importance to predicting the overall future doses over time. As novel components are proposed for disposal unit construction, they will be evaluated as part of the SDF PA Maintenance program.	As the design and construction of the individual saltstone disposal cells are a very expensive capital cost item, disposal unit degradation and its impact on long-term performance is of high interest to DOE in its design and operation of the SDF and associated disposal cells.	• This activity will be evaluated as part of PA maintenance under DOE Manual 435.1-1.
A1-20	*Subsurface K_d Values*	*NRC will monitor the K_d value assumed for Se in sand and clay soils.*	*As discussed in Section 2.7, the NRC staff does not believe that the K_d value assumed in the PA for Se for sand and clay was adequately supported.*	Current soil K_d values for Se are based on literature values as described in WSRC-TR-2006-00004. As Se is not dose-significant radionuclides per the SDF PA, priority for addressing this concern is lower than that of higher-risk radionuclides. DOE will consider additional future maintenance activities to address this factor with respect to Se-79 consistent with their importance to predicting the overall future doses over time.	DOE continues to enhance contaminant transport information through literature review, development of site-specific information and additional experimentation.	• This activity will be evaluated as part of PA maintenance under DOE Manual 435.1-1.

#	Topic	Factor	NRC Basis	Path Forward / Current Maintenance Activities	Technical Justification	Documentation
A1-21	*Environmental Monitoring*	*NRC will monitor results from leak detectors installed under select FDCs.*	*DOE's Consent Order of Dismissal with the SC DHEC requires DOE to install leak detection on Cell 3A and every fifth cell constructed thereafter. Monitoring information from these leak detectors will ensure NRC staff is aware of any early hydraulic failure of the FDCs.*	DOE's Consent Order of Dismissal required DOE to install a "system to collect sample liquids, if any…" This system was installed in Cell 3A.	This is an ongoing DOE monitoring activity. Note that this provision of the Consent Order is not in a paragraph that survives the expiration of the Consent Order.	• DOE will provide this information upon request as it comes available.
A1-22	*Environmental Monitoring*	*NRC will continue to review groundwater monitoring data collected near the SDF.*	*Reviewing groundwater monitoring data will help to ensure NRC staff is aware of any early release of radionuclides from saltstone. It may also provide staff with other indicators of SDF performance, such as unexpected plumes of nitrate or increased alkalinity.*	DOE issues a groundwater monitoring report annually and will provide it to NRC for their review, as requested. No additional action is required at this time.	This is an ongoing DOE monitoring activity.	• DOE will continue to provide this information upon request.
A1-23	*Environmental Monitoring*	*NRC will continue to monitor annual worker dose reports.*	*NRC has previously determined that DOE has an effective program in place to protect individuals during operations. As part of its monitoring responsibilities under the NDAA NRC will continue to monitor annual worker dose reports.*	As determined during previous monitoring activities by the NRC, DOE's radiological protection program standard, 10 CFR 835, is equivalent to the NRC standard, 10 CFR 20. DOE maintains records documenting it's activities and individual worker exposure data. This information is available for review. No additional action is required at this time.	This is an ongoing DOE monitoring activity.	• DOE will continue to provide this information upon request.
A1-24	*Radiation Protection Program*	*NRC will continue to monitor results of DOE's air monitoring system.*	*Releases in the air pathway during operations can contribute to worker dose during operations.*	DOE issues an environmental report containing air monitoring information annually. No additional action is required at this time.	This is an ongoing DOE monitoring activity.	• DOE will continue to provide this information upon request.

#	Topic	Factor	NRC Basis	Path Forward / Current Maintenance Activities	Technical Justification	Documentation
A1-25	*Site Stability*	*NRC will monitor the development of modeling support for the potential for settlement of the SDF due to consolidation of subsurface layers and the potential formation of sinks under the SDF.*	*The potential for differential settlement due to consolidation of soft zones or the formation of sinks under the SDF is important to the assessment of site stability because it appears formation of a sink at the SDF could cause significant saltstone fracturing and disruption to the infiltration controls and disposal units.*	DOE is currently evaluating future maintenance activities to address this factor.	SDF is located in the General Separations Area for SRS as is F-Tank Farm and H-Tank Farm. Evaluation of calcareous zones and formation of sinks in the two tank farm areas has been evaluated and found to be of low risk.	• The Savannah River Site Liquid Waste Facilities Performance Assessment Maintenance Program — FY2012 Implementation Plan currently captures this factor in Section 3.3 under the NRC Recommendations for F-Tank Farm.
A1-26	*Site Stability*	*NRC will monitor updates to DOE modeling of the effects of static settlement on site stability.*	*Recent studies predict greater static settlement in the SDF than addressed by DOE in the PA. Updated modeling is necessary to support DOE's conclusion that static settlement will not adversely affect the performance of the closure cap, disposal units, or saltstone grout.*	DOE is currently evaluating future maintenance activities to further address possible static settlement effects on closure cap, disposal units, and the saltstone matrix.	Closure cap installation is far in the future and therefore will be addressed in the future under the SDF PA Maintenance program. Effects of static settlement on disposal units and grout will be considered further via PA maintenance.	• The Savannah River Site Liquid Waste Facilities Performance Assessment Maintenance Program — FY2012 Implementation Plan currently includes this factor in Section 3.3 under the NRC Recommendations for F-Tank Farm.

Attachment 2: Items Identified in NRC's Technical Evaluation Report Table A-2

#	Topic	Factor	NRC Basis	Path Forward / Current Maintenance Activities	Technical Justification	Documentation
A2-1	*Modeling*	*NRC staff will continue to monitor any changes to the DOE PA for SDF, including the implementation of the conceptual model, consistency of intermediate model results with the conceptual model, quality assurance of models and codes used, and the appropriate use of probabilistic factors, when used.*	*NRC's review of the updated 2009 PA for the SDF, as documented in this TER, indicates the importance of these PA factors in the NRC staff's development of reasonable assurance that waste disposal at the SDF meets the performance objectives for protection of the general population and protection of individuals against inadvertent intrusion.*	This factor deals with changes to SDF PA modeling methods, which is relevant for future PA revisions (Section 2.2.2 of SRR-CWDA-2012-00020). As part of any future SDF PA revision, DOE will evaluate the need for changes in the implementation of the conceptual model, consistency of intermediate model results, model quality assurance and the appropriate use of probabilistic factors.	From pg. 225 of the TER: "*...these items are not as risk-significant as the key monitoring factors.*"	• This activity will be captured in the Savannah River Site Liquid Waste Facilities Performance Assessment Maintenance Program — FY2013 Implementation Plan and will be evaluated as part of PA maintenance under DOE Manual 435.1-1.

#	Topic	Factor	NRC Basis	Path Forward / Current Maintenance Activities	Technical Justification	Documentation
A2-2	*Modeling*	*NRC staff will monitor the defensibility of DOE's conceptual models for releases of radionuclides from the SDF and potential exposures of offsite members of the public and potential inadvertent intruders.*	*Conceptual model uncertainty is difficult to capture in dose models but can dominate the uncertainty in the dose predictions. For example, an alternate conceptual model in which saltstone oxidizes for a long period of time in which little or no water flows into the waste and then is suddenly exposed to increased water flow (e.g., through HDPE failure) could generate a much larger peak dose than a more gradual failure. Because of the potential importance of alternate conceptual models to dose predictions, NRC staff will monitor DOE's consideration of alternate conceptual models in future PA development.*	This factor deals with changes to SDF PA modeling for radionuclide release and potential exposures of offsite members of the public or inadvertent intruders, which is relevant for future PA revisions (Section 2.2.2 of SRR-CWDA-2012-00020). As part of any future SDF PA revision, DOE will evaluate the need for changes to, or addition of, alternative conceptual models.	From pg. 225 of the TER: "*...these items are not as risk-significant as the key monitoring factors.*"	• This activity will be evaluated as part of PA maintenance under DOE Manual 435.1-1.
A2-3	*Waste Form*	*NRC will monitor measurements of intrinsic diffusivity in degraded saltstone and model support for assumptions about intrinsic diffusivity in saltstone used in future PA revisions.*	*DOE Case K results and NRC analyses demonstrate the sensitivity of the magnitude and timing of the dose from Tc-99 to the rate of saltstone oxidation. In DOE Case K, the movement of an oxidation front is modeled as proceeding as a function of the square root of time, which limits the progression of oxidation from older fractures. However, other functional relationships are possible if saltstone degrades and the diffusivity increases with time.*	This factor deals with changes to SDF PA modeling for intrinsic diffusivity of degraded saltstone, which is relevant for future PA revisions (Section 2.2.2 of SRR-CWDA-2012-00020). As part of any future SDF PA revision, DOE will evaluate the need for changes to the diffusivity and oxidation front movement as informed by PA maintenance activities or new literature information.	From pg. 225 of the TER: "*...these items are not as risk-significant as the key monitoring factors.*"	• This activity will be evaluated as part of PA maintenance under DOE Manual 435.1-1.

#	Topic	Factor	NRC Basis	Path Forward / Current Maintenance Activities	Technical Justification	Documentation
A2-4	*Waste Form*	*NRC will monitor model support for K_d values used to represent sorption of radionuclides in saltstone in future PA revisions.*	*Based on DOE and NRC sensitivity analyses for Case A and Case K, saltstone K_d values are expected to affect predicted doses significantly. Because K_d values can affect which radionuclides are the primary dose contributors, the NRC staff will monitor changes in K_d values in saltstone. The NRC staff will monitor model support for saltstone K_d values for radionuclides that are risk-significant based on the K_d values and the uncertainty in those values.*	• This factor is an extension of factors A2-11 and A2-13 which call for further support of Tc, Ra, and Se sorption in saltstone. • This factor deals with changes to SDF PA modeling for K_d values used to represent sorption of radionuclides in saltstone, which is relevant for future PA revisions (Section 2.2.2 of SRR-CWDA-2012-00020).	From pg. 225 of the TER: "*...these items are not as risk-significant as the key monitoring factors.*"	• This activity will be captured in the Savannah River Site Liquid Waste Facilities Performance Assessment Maintenance Program — FY2013 Implementation Plan and will be evaluated as part of PA maintenance under DOE Manual 435.1-1.
A2-5	*Near Field Flow and Transport*	*NRC will monitor the development of model support for any moisture characteristic curves used to modify the permeability of saltstone or disposal unit concrete in a revised PA.*	*DOE's Case A and the sensitivity analyses included in the PA relied on moisture characteristic curves that reduced water flow through saltstone, fracture, and disposal unit concrete more than expected based on comparison to curves published for similar materials. DOE's Case K analysis does not take credit for decreasing permeability with decreasing saturation (as described by moisture characteristic curves) and instead assumes the relative permeability always is 1. Because of the sensitivity of projected doses to the modeled permeability of saltstone, the development of appropriate model support for any moisture characteristic curves used in a revised base case is expected to be important to the development of reasonable assurance that waste disposal meets the performance objectives.*	This factor deals with changes to SDF PA modeling for moisture characteristic curves and permeability, which is relevant for future PA revisions (Section 2.2.2 of SRR-CWDA-2012-00020). As part of any future SDF PA revision, DOE will evaluate the use of moisture characteristic curves as informed by PA maintenance activities or new literature information.	From pg. 225 of the TER: "*...these items are not as risk-significant as the key monitoring factors.*"	• This activity will be captured in the Savannah River Site Liquid Waste Facilities Performance Assessment Maintenance Program — FY2013 Implementation Plan and will be evaluated as part of PA maintenance under DOE Manual 435.1-1.

#	Topic	Factor	NRC Basis	Path Forward / Current Maintenance Activities	Technical Justification	Documentation
A2-6	*Near Field Flow and Transport*	*NRC will monitor model support for K_d values used to represent sorption of radionuclides in disposal unit concrete.*	*As discussed in NRC's barrier analysis (Section 2.13.3), the K_d values used in disposal unit concrete can have a significant effect on the modeled release rate of radionuclides into the nearfield environment. Release rates, in turn, can directly affect the predicted dose.*	• This factor is an extension of factors A1-15 and A1-16 which call for further support of Tc, Ra, and Se sorption in disposal unit concrete. • This factor deals with changes to SDF PA modeling for K_d values used to represent sorption of radionuclides to disposal unit concrete, which is relevant for future PA revisions (Section 2.2.2 of SRR-CWDA-2012-00020).	From pg. 225 of the TER: "*...these items are not as risk-significant as the key monitoring factors.*"	• This activity will be captured in future revisions to the PA maintenance implementation plan and will be evaluated as part of PA maintenance under DOE Manual 435.1-1.
A2-7	*Far-Field Flow*	*NRC will monitor the adequacy of DOE's far-field model calibration.*	*The calibration process could be improved and made more transparent, particularly in the area near to the SDF, to provide confidence that the level of dilution and dispersion in DOE's SDF transport models is not overstated.*	• This factor deals with changes to SDF PA modeling for dilution and dispersion, which is relevant for future PA revisions (Section 2.2.2 of SRR-CWDA-2012-00020). As part of any future SDF PA revision, DOE will evaluate any potential improvements to the calibration process as informed by any new information. • Transparency of the calibration process will be in accordance with applicable DOE requirements and guidance.	From pg. 225 of the TER: "*...these items are not as risk-significant as the key monitoring factors.*"	• This activity will be evaluated as part of PA maintenance under DOE Manual 435.1-1.
A2-8	*Far-Field Flow*	*NRC will monitor DOE's source loading approach to ensure that the dose estimates are not significantly under-predicted.*	*If DOE were to change how disposal unit releases are loaded into the far-field model to ensure that (i) the same amount of mass is loaded into the saturated zone underneath each individual FDC, and (ii) that source loading occurs at the water table in the far-field model, the results of the simulations could be significantly different. Scoping simulations performed by NRC staff using Tc-99 fluxes from Case K indicate that the peak sector concentrations at the 100 m boundary could be significantly higher for some sectors.*	• This factor deals with changes to SDF PA modeling for source loading, which is relevant for future PA revisions (Section 2.2.2 of SRR-CWDA-2012-00020). As part of any future SDF PA revision, DOE will evaluate the methods used for source loading at the water table and its potential impact to dose results.	From pg. 225 of the TER: "*...these items are not as risk-significant as the key monitoring factors.*"	• This activity will be evaluated as part of PA maintenance under DOE Manual 435.1-1.

#	Topic	Factor	NRC Basis	Path Forward / Current Maintenance Activities	Technical Justification	Documentation
A2-9	*Far-Field Flow*	*NRC will monitor the appropriateness of selected dispersivities and the need for additional vertical or horizontal mesh refinement to ensure that contaminant plumes are not artificially dispersed in the far-field model.*	*DOE presented results in the FTF RAI responses (SRR-CWDA-2009-00054) that indicate additional grid refinement may be necessary to reduce numerical dispersion in cases of very low to no assumed physical dispersion; this analysis is expected to be relevant to the SDF because the local FTF and SDF models have the same grid resolution. For example, if no physical dispersion is assumed, then the peak concentrations associated with a pulse release of a conservative tracer are shown to be a factor of approximately three to four times higher with a grid refined by a factor of two in each dimension (or a factor of 8 times more elements).*	• This factor deals with changes to SDF PA modeling for dispersivities and model refinement, which is relevant for future PA revisions (Section 2.2.2 of SRR-CWDA-2012-00020). As part of any future SDF PA revision, DOE will evaluate the need to refine the modeled grid spacing to address questions about numerical dispersion and the benefit of increased grid spacing versus the negative impact to the computer analysis run times.	From pg. 225 of the TER: "*...these items are not as risk-significant as the key monitoring factors.*"	• This activity will be evaluated as part of PA maintenance under DOE Manual 435.1-1.

#	Topic	Factor	NRC Basis	Path Forward / Current Maintenance Activities	Technical Justification	Documentation
A2-10	*Far-Field Flow*	*NRC will monitor DOE's efforts to collect data and information to evaluate the potential impact of calcareous zones on contaminant flow and transport at the SDF.*	*Many SDF sources traverse the lower zone of the UTR aquifer where calcareous materials are more pervasive in the subsurface at SRS. Some evidence exists that contaminants in Burial Ground Complex (located in E-Area at the GSA) and the Chemical, Metals, and Pesticide Pits (located off the GSA) may be preferentially transported within these zones. In an FTF RAI resolution meeting (NRC, 2011x) DOE indicated that a field mapping activity could be performed. If calcareous zone seeps are identified, tracer studies in the SDF UTR-LZ using innocuous tracers that are commonly used to understand preferential flow and transport could be conducted to better understand the effect of these zones on contaminant flow and transport.*	• DOE is currently evaluating future maintenance activities to address this factor. This factor is an extension of factor A1-25 that addresses the probability of the formation of sinks in and around FTF and HTF.	From pg. 225 of the TER: "*...these items are not as risk-significant as the key monitoring factors.*" SDF is located in the General Separations Area for SRS as is F-Tank Farm and H-Tank Farm. Evaluation of calcareous zones and formation of sinks in the two tank farm areas has been evaluated and found to be of low risk.	• The Savannah River Site Liquid Waste Facilities Performance Assessment Maintenance Program — FY2012 Implementation Plan currently captures this factor in Section 3.3 under the NRC Recommendations for F-Tank Farm.
A2-11	*Far-Field Flow*	*NRC will monitor model support for K_d values used to represent sorption of radionuclides in site soil.*	*Sorption in soil can significantly affect doses from short- to moderate-half-life radionuclides if they are retained long enough to experience significant decay. Thus NRC will monitor support for K_d values for risk-significant radionuclides or radionuclides that may become risk-significant based on the choice of K_d values.*	• This factor is an extension of factor A1-20 which calls for further support of Se sorption in site soil. Refer to A1-20 for current activities to address this factor. • This factor deals with changes to SDF PA modeling for K_d values used to represent sorption in site soil, which is relevant for future PA revisions (Section 2.2.2 of SRR-CWDA-2012-00020). As part of any future SDF PA revision, DOE will evaluate the use of new K_d values as informed by PA maintenance activities or new literature information.	From pg. 225 of the TER: "*...these items are not as risk-significant as the key monitoring factors.*"	• This activity will be evaluated as part of PA maintenance under DOE Manual 435.1-1.

#	Topic	Factor	NRC Basis	Path Forward / Current Maintenance Activities	Technical Justification	Documentation
A2-12	*Biosphere*	*NRC will monitor whether K_d values for key radionuclides in surface soil are expected to significantly increase predicted radionuclide build-up in biosphere soil.*	*Distribution coefficients used in the build-up analysis were based on values selected conservatively in the context of hydrologic transport modeling (i.e., values were purposefully biased low). This selection process is non-conservative when applied to irrigation and soil sorption modeling because lower sorption values could underestimate radionuclide build-up. NRC staff scoping calculations show using site-specific K_d measurements could increase estimated build-up by approximately a factor of 2 to 5. This increase would result in a higher predicted soil concentration and a higher projected dose from ingestion of plant and animal products.*	• This factor deals with changes to SDF PA modeling for radionuclide in biosphere soil, which is relevant for future PA revisions (Section 2.2.2 of SRR-CWDA-2012-00020). As part of any future SDF PA revision, DOE will evaluate the use of appropriate site-specific K_d values for soil build-up calculations as informed by PA maintenance activities or new literature information.	From pg. 225 of the TER: "*...these items are not as risk-significant as the key monitoring factors.*"	• This activity will be evaluated as part of PA maintenance under DOE Manual 435.1-1.
A2-13	*Biosphere*	*NRC will monitor consumption factors and uncertainty distributions for transfer factors.*	*The assumed consumption of drinking water in the 2009 PA is approximately a factor of 2 less than EPA recommended assumption of 2 L/d and is not supported by site-specific information. Transfer factors can have considerable uncertainty, which should be evaluated in any future probabilistic model.*	• This factor deals with changes to SDF PA modeling for consumption and transfer factors, which is relevant for future PA revisions (Section 2.2.2 of SRR-CWDA-2012-00020). As part of any future SDF PA revision, DOE will evaluate the assumed consumption of drinking water and probabilistic transfer factor modeling as informed by PA maintenance activities or new literature information.	From pg. 225 of the TER: "*...these items are not as risk-significant as the key monitoring factors.*"	• This activity will be evaluated as part of PA maintenance under DOE Manual 435.1-1.