April 21, 2014

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

THRU: Christepher McKenney, Chief **/RA/**
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FROM: Christopher Grossman, Systems Performance Analyst **/RA/**
Performance Assessment Branch
Environmental Protection
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Division of Waste Management
and Environmental Protection

SUBJECT: TECHNICAL REVIEW: U.S. DEPARTMENT OF ENERGY DOCUMENTATION RELATED TO FEATURES, EVENTS, AND PROCESSES IN THE F-AREA TANK FARM PERFORMANCE ASSESSMENT

The U.S. Nuclear Regulatory Commission (NRC) staff has performed a technical review of the subject documents prepared by the U.S. Department of Energy (DOE) that address the NRC staff technical evaluation report comments related to the documentation of scenario analysis for the F-Area Tank Farm (FTF) Performance Assessment (SRS-REG-2007-00002, Rev. 1). This technical review memorandum supports Monitoring Factor 6.1, “Scenario Analysis” listed in the NRC staff’s FTF Monitoring Plan (available in the Agencywide Documents Access and Management System (ADAMS) Accession No. ML12212A192).

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As described in the enclosure, DOE prepared an *ex post facto* analysis of features, events, and processes (FEPs) considered for the liquid waste performance assessments and an evaluation of the adequacy of the disposition of included FEPs in the FTF Performance Assessment. The NRC staff's review of DOE's identification of FEPs found that DOE's identification is adequate. The NRC staff's review of the DOE screening methodology finds that DOE properly focused on likelihood and impact as criteria for screening, but identifies several concerns with DOE's screening of FEPs, including the membership of the FEPs screening team and the documentation of each subject matter expert's basis for judgment. The NRC staff's review also identifies questions with the screening process for selected FEPs. Finally, the NRC staff's review finds that DOE's crosswalk of included FEPs has the potential to enhance transparency and traceability; while NRC staff identifies multiple examples where transparency and traceability are reduced, which results in a loss of confidence that all relevant FEPs are adequately considered in the FTF Performance Assessment. The questions and issues raised in the enclosure can be addressed as part of DOE's performance assessment maintenance program or as part of special analyses for specific tank closures.

Enclosure:
Technical Review of Features,
Events, and Processes in the F-Area Tank
Farm Performance Assessment

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Enclosure:
Technical Review of Features,
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Technical Review of Features, Events, and Processes in the F-Area Tank Farm Performance Assessment

Date: March 25, 2014

Reviewers:

Mr. Christopher Grossman and Ms. Cynthia Barr, U.S. Nuclear Regulatory Commission (NRC), And Ms.Cynthia Dinwiddie, Southwest Research Institute®

Documents:

SRR-CWDA-2012-00011. Hommel, S. "Features, Events, and Processes for Liquid Waste Performance Assessments." Revision 0. Aiken, South Carolina: Savannah River Remediation, LLC. February 14, 2012.

SRR-CWDA-2012-00022. Hommel, S. "Evaluation of Features, Events, and Processes in the F-Area Tank Farm Performance Assessment." Revision 0. Aiken, South Carolina: Savannah River Remediation, LLC. February 15, 2012.

Summary of Documents:

The U.S. Department of Energy (DOE) prepared an *ex post facto* evaluation of features, events, and processes (FEPs) for the F-Area Tank Farm (FTF) Performance Assessment (SRS-REG-2007-00002, Rev 1). The aforementioned reports document the analysis which consisted of four steps:

(Step 1) Implementation of FEPs in the FTF Performance Assessment;
(Step 2) Identification of FEPs;
(Step 3) Screening of FEPs; and
(Step 4) Evaluation of FEPs included for consideration in the FTF Performance Assessment.

Identification of FEPs:

Specifically, SRR-CWDA-2012-00011, Rev. 0 documents the methods used in identification of FEPs (i.e., Step 2) that could potentially affect the performance of Savannah River Site (SRS) liquid waste closure facilities and the criteria to screen FEPs (i.e., Step 3) for inclusion in or exclusion from the performance assessments (e.g., FTF Performance Assessment). SRR-CWDA-2012-00022, Rev. 0 documents a crosswalk that maps included FEPs to the FTF Performance Assessment (SRS-REG-2007-00002, Rev 1) and evaluates whether the FTF Performance Assessment appropriately incorporates included FEPs (Step 4). Implementation of FEPs in the FTF Performance Assessment was performed prior to Steps 2-4 during development of the FTF Performance Assessment (SRS-REG-2007-00002).

The identification of FEPs (Step 2) included the compilation of FEPs from several domestic and international lists for radioactive waste management. Specifically, DOE compiled FEPs from the sources listed in Table 1. The compilation of FEPs from these sources resulted in a total of

1,383 FEPs including duplicates. DOE then proceeded to remove duplicates and combine similar FEPs, which resulted in 245 unique FEPs. DOE categorized the 245 unique FEPs into six groups and 32 associated subgroups that were used to perform the screening (Step 3) for the liquid waste performance assessments. See Table 2 for a listing of categories. DOE then reviewed the existing liquid waste performance assessments and identified 17 additional FEPs that were missing from the initial list, resulting in a total of 262 initial FEPs to be screened during Step 3.

Table 1. Sources for Identification of Features, Events, and Processes for Savannah River Site Liquid Waste Performance Assessments

Source Document	Number of FEPs
Safety Assessment Methodologies for Near-Surface Disposal Facilities, Results of a Coordinated Research Project, Volume 1 [IAEA, 2004]	141
Features, Events, and Processes for the Disposal of Low Level Radioactive Waste FY2011 Status Report [FCRD-USED-2011-000297]	449
Features, Events, and Processes for the Total System Performance Assessment: Analyses [ANL-WIS-MD-000027 REV 0]	374
Deep Geologic Repository for OPG's Low and Intermediate Level Waste, Post-Closure Safety Assessment (Volume 1): Features, Events and Processes [NWMO DGR-TR-2009-05]	299
Encyclopedia of Features, Events and Processes (FEPs) for the Swedish SFR and Spent Fuel Repositories [Miller et al., 2002]	120

Table 2. Categories of Features, Events, and Processes for Liquid Waste Performance Assessment at the Savannah River Site

Group	Subgroup
1.0 Assessment Basis	1.1 General
	1.2 Regulations and Controls
	1.3 Models and Calculations
	1.4 Other Assessment Factors
2.0 External Factors	2.1 Human Characteristics
	2.2 Land and Water Management
	2.3 Future Human Activity
	2.4 Biological Factors
	2.5 Geologic Features
	2.6 Geologic Processes
	2.7 Climate
	2.8 Water Cycle
3.0 Closure System	3.1 General Closure System
	3.2 Pre-Closure Activities
	3.3 Closure System Components
	3.4 Closure System Hydrology
	3.5 Chemical Processes
	3.6 Thermal Processes
	3.7 Material Degradation
	3.8 Other Closure System Factors
4.0 Contaminant Factors	4.1 Contaminant Description
	4.2 Contaminant Properties
	4.3 Concentrations
	4.4 Exposure Factors
	4.5 Other Contaminant Factors
5.0 Flow and Transport	5.1 Flow Factors
	5.2 Hydraulic Effects on Flow
	5.3 Release and Transport
6.0 Disruptive Events	6.1 Intrusions
	6.2 Seismic Events
	6.3 Igneous Events
	6.4 Other Events

Screening of FEPs:

DOE performed a qualitative screening (Step 3) of each of the 262 unique FEPs based on programmatic requirements, the perceived probability of occurrence within 10,000 years, and the perceived consequence relative to final performance assessment results and expected compliance. First, DOE reviewed the FEPs and identified 46 of the 262 FEPs that required inclusion for programmatic purposes, leaving 216 of the FEPs for further screening according to perceived probability and consequence. DOE assembled a team of nine subject matter experts to conduct the screening process considering perceived probability of occurrence and consequence in two phases.

In the first phase of the screening, each team member independently assigned one of three values (i.e., 0, 1, or 2) for both perceived frequency within 10,000 years and perceived impact on release or dose. Table 3 provides a matrix of possible results from the assignments. FEPs were screened in/out during this phase based on whether there was unanimity amongst the team members on the ranking for the FEP being screened. For example, FEPs for which *all* team members assigned perceived frequency values of 0 and impact values of 0 were screened out (i.e., excluded from consideration in the liquid waste performance assessments) without further consideration in the second screening phase. Likewise, FEPs for which *all* team members assigned a perceived frequency value of 2 and an impact value of 2 were screened in without further consideration in the second phase. FEPs for which the results of the first phase of screening did not result in unanimity were considered further in the second phase of screening. DOE reports that the first phase of screening resulted in five of the initial FEPs being screened out from further consideration in the liquid waste performance assessments. Likewise, DOE screened in 69[1] FEPs for implementation in the liquid waste performance assessments. This left 142 FEPs for further consideration in the second phase of the screening process.

Table 3. FEPs Screening Criteria Matrix†

Frequency		Beyond Extremely Unlikely	Unlikely or Extremely Unlikely	Anticipated, Expected, or Already Known to Exist or Occur
Impact		0	1	2
High	2	*Considered*	Screened In	Screened In
Moderate	1	Screened Out	*Considered*	*Considered*
Negligible	0	Screened Out	Screened Out	Screened Out

† Adapted from Table 4.1-3 of SRR-CWDA-2012-00011, Rev. 0

In the second phase of the screening process, the team of nine subject matter experts discussed the remaining 142 FEPs from the first phase. In the second phase, the experts also reconsidered three FEPs that were screened out during the first phase (i.e., FEPs 6.4.08

[1] DOE actually screens in 70 FEPs during the first phase of screening. However, DOE reconsiders FEP 6.4.07 during the second phase and subsequently screens it out as discussed later, therefore, the count reported here does not reflect a screening decision on this FEP and it is counted in the quantity of FEPs considered further during the second phase (i.e., as part of the 142 FEPs considered during the second phase).

through 6.4.10)[2] and one FEP that was screened in during the first phase (i.e., FEP 6.4.07). The discussions were reported to consider the probability and impact values for each FEP as well as available knowledge (or uncertainty) and synergism with other FEPs. The team evaluated these FEPs, screened them accordingly, and developed a justification for FEPs that were screened out. During the second phase, 27 FEPs were screened out[3] and 115 FEPs were screened in for implementation in the liquid waste performance assessments after discussion and evaluation by the team of subject matter experts. Table 4 summarizes the number of FEPs screened during each phase. In total, DOE screened in 230 FEPs for further consideration in the liquid waste performance assessments and screened out 32 FEPs from further consideration in the liquid waste performance assessments.

Table 4. Number of FEPs Screened During Each Phase

	In	Out
Programmatic	46	0
Phase 1	69	5
Phase 2	115	27
Total	**230**	**32**

Evaluation of FEPs Implementation in Performance Assessment:

In Step 4, DOE provided a short technical basis for each FEP and a cross-walk to relevant FTF reference documents that address the relevant FEP. DOE notes that not all of the 230 FEPs that were screened in are explicitly implemented in the FTF Performance Assessment (SRS-REG-2007-00002, Rev. 1). Rather, DOE came to the conclusion that the FTF Performance Assessment appropriately considered the relevant FEPs either explicitly or implicitly.

[2] DOE screens out FEPs 6.4.08 through 6.3.10 during the first phase. The second phase confirmed the decision to screen them out. Therefore, they are counted in the quantity of FEPs screened out during the first phase rather than in the quantity of FEPs considered/screened in the second phase.

[3] The second phase of screening reversed the decision made during the *first* phase to screen *in* FEP 6.4.07, therefore, it is accounted for in the quantity of FEPs that were screened *out* during the *second* phase. Whereas, the decision made during the first phase to screen *out* FEPs 6.4.08 through 6.4.10 was reaffirmed, thus they are accounted for in the quantity screened *out* during the *first* phase.

NRC Evaluation:

The NRC staff evaluated DOE's methodology for identification of FEPs, screening of FEPs for further consideration, and implementation of FEPs in the FTF Performance Assessment (SRS-REG-2007-00002, Rev. 1).

Identification of FEPs:

To review DOE's identification of FEPs, the NRC staff used Section 4.1.1.3 of NUREG-1854 (ML072360184) as well as Section 3.2.1 of NUREG-1573 (ML003770778). Also, the NRC staff consulted the list of FEPs for near-surface disposal of radioactive waste compiled by the International Atomic Energy Agency (IAEA, 2004) for comparison to DOE's initial list of FEPs for liquid waste performance assessments to provide assurance that DOE's list of FEPs was reasonably complete. The NRC staff found that nearly all the FEPs documented in IAEA (2004) were reasonably represented in the initial list of FEPs identified by DOE in SRR-CWDA-2012-00011, Rev. 0. The NRC staff notes that SRR-CWDA-2012-00011, Rev. 0 does not appear to identify four FEPs related to climate change that are identified by IAEA (2004) and may be relevant to liquid waste tank closure at SRS over the time periods considered:

- Hydrological/hydrogeological response to climate changes
- Ecological response to climate changes
- Human response to climate changes
- Other geomorphological changes

However, in response to an NRC request for additional information during the consultation on the draft Basis Document for the H-Area Tank Farm (HTF) (DOE/SRS-WD-20130-001, Rev. 0) regarding FEP screening, DOE provided a Microsoft® Excel spreadsheet, entitled "SRS_LW_FEPs_Rev0.xlsx" which identifies the four FEPs from IAEA (2004) and appears to roll them into DOE's FEP 2.7.07, "Climate Change" although this consolidation is not transparent to NRC staff in SRR-CWDA-2012-00011, Rev. 0 (See response to CC-PA-1; SRR-CWDA-2013-00106, Rev. 1). Therefore, the NRC staff's review of DOE's identification of FEPs finds that DOE's identification is adequate.

Screening of FEPs:

To review DOE's screening of FEPs, the NRC staff reviewed DOE's screening methodology and its documented basis for excluding individual FEPs using the guidance in Section 4.1.1.3 of NUREG-1854 (ML072360184) and Section 3.2.1 of NUREG-1573 (ML003770778) to ensure that key FEPs have been included in the performance assessment. The NRC staff notes that criteria in 10 CFR Part 61 and NRC guidance on screening of FEPs for disposal of low-level radioactive waste are limited. The NRC staff does provide more extensive criteria and guidance for screening of FEPs for geologic disposal of high-level waste under 10 CFR Part 63. However, the approach envisioned under 10 CFR Part 63 places a numerical limit on the chance that a FEP might occur in a year, due to the higher hazard associated with geologic disposal of high-level radioactive waste.

DOE's methodology considers: (i) the perceived likelihood of a FEP occurring within 10,000 years and (ii) the perceived impact on release or dose. DOE's emphasis on likelihood of occurrence and significance of the impact on release or dose is a reasonable approach to screen FEPs for further consideration in the liquid waste performance assessments. This emphasis is similar to the approach envisioned for 10 CFR Part 63, but focuses on qualitative judgments of perceived likelihoods and impacts rather than quantitative estimates. While quantification would enhance DOE's approach, the NRC staff finds that DOE's emphasis on likelihood and impact is reasonable, considering a graded approach, for screening of FEPs from a performance assessment for incidental wastes. DOE also provides documentation of which rationale is relied upon for the screening decision in the case of excluded FEPs. However, the NRC staff notes that the justification provided for excluding a number of FEPs during the second phase (See Table 4.3-1 of SRR-CWDA-2012-00011, Rev. 0) appears to mix the likelihood and impact criteria. For instance, FEP 2.6.03, Orogeny, is screened out with the following justification:

> *This FEP is screened out based on the professional judgment of the FEPs Screening Team members that it would be beyond extremely unlikely for this to affect PA [performance assessment] results.*

The NRC staff finds this justification confusing as to whether the FEP is perceived as unlikely to occur during the 10,000 years, or unlikely to affect the results of the performance assessment. In some cases, the meanings could be equivalent, but not necessarily so, and this may lead to confusion and a loss of transparency. For transparency, DOE should clarify FEPs with the aforementioned justification. The clarification should identify that: (i) the FEP is perceived to be unlikely during the assessment period, (ii) the impact of the FEP is perceived to be insignificant according to DOE's decision criteria, or (iii) the FEP is both perceived to be unlikely and its impact is insignificant.

Next, NRC reviewed the qualifications of the team of nine members that performed the screening via expert judgment. The NRC staff notes that NUREG-1563 (ML033500190) recommends that subject matter experts, even for informal professional judgments be knowledgeable individuals, in engineering and science, who, by nature of their experience and academic achievement, can speak to the understanding of certain scientific laws and principles. The membership of DOE's team minimally meets this requirement, however, the NRC staff notes that the expertise appears to be focused on performance assessment and appears to be limited in the areas of geosciences, corrosion, and cementitious materials behavior. Preferably, DOE should include subject matter experts in the specific engineering and scientific disciplines that are pertinent to the expert judgment being made, particularly for judgments regarding FEPs that are perceived to be more likely or have larger impacts. In some cases, subject matter experts may not be available due to the nature of the FEP or resource limitations. In these cases, DOE should document more clearly the specific expertise of the chosen experts and how their experience relates to the expert judgment being made. Regardless of whether appropriate subject matter experts are utilized, DOE should clearly document a transparent technical basis for the screening decision that also provides a traceable link to the information both considered and relied upon to arrive at the screening decision.

NUREG-1563 (ML033500190) also indicates that the NRC staff will accept for review the results of formal or informal judgment so long as the rationale associated with the judgment is adequate, transparent, and sufficiently documented. The NRC staff notes that documentation of an individual subject matter expert's basis for judgment is not included from the first phase of the screening in which subject matter experts assign values for perceived likelihood and impact for each FEP. Further, documentation in SRR-CWDA-2012-00011, Rev. 0 of the discussions from the second phase of screening and why subject matter experts may have been swayed from initial opinions on the criteria to arrive at a consensus opinion are not provided. In response to an NRC request for additional information during the HTF consultation, DOE provided a Microsoft© Excel spreadsheet entitled "SRS-LW-FEPs_Rev0.xlsx" (See response to CC-PA-2; SRR-CWDA-2013-00106, Rev. 1). However, the DOE response provides sparse information regarding the rationales for individual subject matter expert's judgments and little to no information on the data considered during the first phase of screening. Further, the response provides no information on why subject matter experts may have been swayed from initial opinions to arrive at a consensus in the second phase. DOE should enhance the transparency and traceability of the expert judgment process to be consistent with the guidance provided in NUREG-1563 (ML033500190) for informal expert judgment. Specifically, subject matter experts should provide reasoning for their judgments and the data, if any, from which those judgments are formed. Further, sufficient documentation should exist to allow external examination of what the judgments are, how the judgments are arrived at (i.e., their basis including supporting data), and how the judgments are used.

Finally, the NRC staff has questions regarding the screening decisions for the following FEPs. The outstanding questions are identified with each FEP below:

- 2.7.04, Acid Rain – (Excluded) It is not clear to the NRC staff why this is outside the scope of a liquid waste performance assessment. The NRC staff believes that information on existing pollution and its effects on performance of the closed tanks could be considered in the performance assessment should the anticipated impact be expected to be sufficiently significant.

- 2.2.07, Pollution – (Excluded) It is not clear to the NRC staff why this is outside the scope of a liquid waste performance assessment. The NRC staff believes that information on existing pollution and its effects on performance of the closed tanks could be considered in the performance assessment should the anticipated impact be expected to be sufficiently significant.

- 3.5.12, Chelating Agents Effects – (Excluded) It is not clear to the NRC staff how DOE considered the effects of chelating agents such as oxalates that result from the use of oxalic acid during tank cleaning on contaminant mobility. Other examples of chelating agents may include humic or fulvic acids in SRS soils or agents used in the solvent extraction processes from F and H canyons that remain in the waste stored at the FTF and HTF.

- 3.6.01, Thermal Processes and Conditions the Engineered System – (Excluded) It is not clear to NRC staff how DOE considered the effects of heat of hydration and its effects on changes to stresses that may change both hydrologic and mechanical properties of the engineered components.

- 3.6.04, Thermo-Mechanical Stresses Alter Characteristics of Engineered Barrier System Components – (Excluded) See discussion for FEP 3.6.01 above.

- 6.2.04, Seismicity Associated with Igneous Activity – (Excluded) It is not clear to the NRC staff whether the rationale for screening this FEP out is related to the subject of this particular FEP. The justification provided in Table 4.3-1 of SRR-CWDA-2012-00011, Rev. 0 for screening out this FEP indicates that the closure system does not have enough heat to significantly impact the results. This rationale appears unrelated to the subject of this particular FEP.

Evaluation of FEPs Implementation in Performance Assessment:

The NRC staff also reviewed DOE's evaluation of whether the FTF Performance Assessment appropriately incorporates FEPs that were screened for inclusion as documented in SRR-CWDA-2012-00022, Rev. 0. SRR-CWDA-2012-00022, Rev. 0 provides a cross-walk of each FEP to the relevant sections of the FTF Performance Assessment (SRS-REG-2007-00002, Rev. 1) or supporting references and a summary of the DOE findings of whether included FEPs were appropriately incorporated in the performance assessment. The NRC staff's review finds that the cross-walk has the potential to enhance transparency and traceability. However, NRC staff notes that many of the selected FEPs it reviewed are cross-walked to either an erroneous section of the FTF Performance Assessment or a section that provides only an example of where the particular FEP is implemented in the FTF Performance Assessment, and is generally not comprehensive. In some cases, the cross-walk does not link every instance or links to an erroneous instance where the implementation of the FEP is discussed, while in other cases, the level of detail that is provided by SRR-CWDA-2012-00022, Rev. 0 regarding the implementation of the FEP in the FTF Performance Assessment is inadequate.

In the former case, NRC staff points to FEP 3.5.04, "Evolving Water Chemistry in the Far-Field" as an example. SRR-CWDA-2012-00022, Rev. 0 cross-walks implementation of this FEP to Section 5.2.1 of the FTF Performance Assessment (SRS-REG-2007-00002, Rev. 1). SRR-CWDA-2012-00022, Rev. 0 (see Table 3.0-1) indicates that the "Water chemistry evolution (such as E_h and pH transitioning) is a primary driver in changes to contaminant transport properties." DOE appears to have confused its near-field modeling, which implicitly models E_h and pH changes, with its far-field modeling, which does not appear to model pH and E_h evolution when describing how this FEP is implemented in the FTF Performance Assessment. Further, NRC staff finds that the FTF Performance Assessment (SRS-REG-2007-00002, Rev. 1) provides no discussion in Section 5.2.1 of how the evolution of water chemistry in the far-field is implemented in the performance assessment. Therefore, it appears that DOE does not consider the evolution of water chemistry in the far-field in its performance assessment even though it screens in this FEP. Other examples among the sampling of FEPs reviewed by NRC staff that are reportedly screened in, but in fact not implemented in the FTF Performance Assessment base case, or are cross-walked to erroneous sections are: FEP 3.5.11, "Reaction

Kinetics", FEP 3.5.07, "Colloidal Generation", and FEP 3.7.09, "Concrete Shrinkage/Expansion".

In the latter case described earlier regarding the level of detail, the NRC staff points to FEP 3.4.04, "Resaturation and Desaturation" as an example. The NRC staff notes that this is a general FEP, but DOE appears to limit its consideration to the closure cap. DOE provides no documentation in SRR-CWDA-2012-00022, Rev. 0 regarding the consideration of resaturation and desaturation on other components of the FTF closure system such as the steel liner or cementitious materials. Given that some of the tanks at FTF are in the zone of fluctuation of the water table, for instance, would warrant implementation in the FTF Performance Assessment of processes affiliated with wet/dry cycling. Other examples among the sampling of FEPs reviewed by NRC staff that are considered in insufficient detail are:

- FEP 1.3.12, "Model Confidence", which only considers DOE's benchmarking of FTF GoldSim™ and PORFLOW™ model results, rather than the more comprehensive effort to provide confidence in the output of the models via multiple lines of supporting evidence;

- FEP 3.5.01, "Chemical/Geochemical Processes and Conditions", which does not provide traceability to the various chemical/geochemical processes considered (e.g., oxalic acid impacts on waste release) in the FTF Performance Assessment; and

- FEP 3.5.09, "Rind (Chemically Altered Zone) Forms in the Near-Field", for which DOE provides limited discussion of chemically altered zones, other than soils impacted by cement leachate, such as weathering or coating of fracture surfaces.

The result of these examples is a lack of transparency and traceability and reduced confidence that all relevant FEPs are included in the FTF Performance Assessment. The NRC staff recommends that DOE improve the transparency and traceability of its implementation of FEPs as described in SRR-CWDA-2012-00022, Rev. 0 to ensure comprehensive, accurate, and traceable links to clear descriptions of how included FEPs are actually implemented in the FTF Performance Assessment.

Teleconference or Meeting:

The NRC staff will follow-up on DOE's plans to address the issues identified herein during future on-site observations.

Follow-up Actions:

The NRC staff will continue to monitor DOE's identification, screening, and implementation of FEPs in the FTF Performance Assessment under Monitoring Factor 6.1, "Scenario Analysis" listed in the NRC staff's FTF Monitoring Plan (ML12212A192) focusing on the technical concerns listed in this review report.

Open Issues:

There are currently no open issues.

Conclusions:

DOE prepared an *ex post facto* analysis of FEPs considered for the liquid waste performance assessments and an evaluation of the adequacy of the disposition of included FEPs in the FTF Performance Assessment. DOE identifies, and NRC agrees, that this is not how the identification and screening of FEPs are typically performed for performance assessment. Rather, these steps should be employed early in the process to inform the development of a robust performance assessment, provide transparency and traceability for stakeholders, and ultimately provide confidence that the performance assessment is comprehensive. The NRC staff's review of DOE's identification of FEPs finds that DOE's identification is adequate. The NRC staff's review of the DOE screening methodology finds that DOE properly focused on likelihood and impact as criteria for screening, but identifies several concerns with DOE's screening of FEPs, including the membership of the FEPs screening team and the documentation of each subject matter expert's basis for judgment. The NRC staff's review also identifies questions with the screening process for selected FEPs. Finally, the NRC staff's review finds that DOE's crosswalk of included FEPs has the potential to enhance transparency and traceability; however, NRC staff identifies multiple examples where transparency and traceability are reduced which results in a loss of confidence that all relevant FEPs are adequately considered in the FTF Performance Assessment. The NRC staff believes that the questions and issues raised can be addressed as part of DOE's performance assessment maintenance program or as part of special analyses for specific tank closures.

References:

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