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Performance Assessment Program for the Savannah River Site Liquid Waste Facilities - 13610

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ABSTRACT

The Liquid Waste facilities at the U.S. Department of Energy's (DOE) Savannah River Site (SRS) are operated by Liquid Waste Operations contractor Savannah River Remediation LLC (SRR). A separate Performance Assessment (PA) is prepared to support disposal operations at the Saltstone Disposal Facility and closure evaluations for the two liquid waste tank farm facilities at SRS, F-Tank Farm and H-Tank Farm. A PA provides the technical basis and results to be used in subsequent documents to demonstrate compliance with the pertinent requirements identified in operations and closure regulatory guidance. The Saltstone Disposal Facility is subject to a State of South Carolina industrial solid waste landfill permit and the tank farms are subject to a state industrial waste water permit. The three Liquid Waste facilities are also subject to a Federal Facility Agreement approved by the State, DOE and the Environmental Protection Agency (EPA). Due to the regulatory structure, a PA is a key technical document reviewed by the DOE, the State of South Carolina and the EPA. As the waste material disposed of in the Saltstone Disposal Facility and the residual material in the closed tank farms is also subject to reclassification prior to closure via a waste determination pursuant to Section 3116 of the Ronald W. Reagan National Defense Authorization Act of Fiscal Year 2005, the U.S. Nuclear Regulatory Commission (NRC) is also a reviewing agency for the PAs. Pursuant to the Act, the NRC also has a continuing role to monitor disposal actions to assess compliance with stated performance objectives.

The Liquid Waste PA program at SRS represents a continual process over the life of the disposal and closure operations. When the need for a PA or PA revision is identified, the first step is to develop a conceptual model to best represent the facility conditions. The conceptual model will include physical dimensions of the closed system, both the engineered and natural system, and modeling input parameters associated with the modeled features, both initial values (at the time of facility closure) and degradation rates/values. During the development of the PA, evaluations are conducted to reflect not only the results associated with the best available information at the time but also to evaluate potential uncertainties and sensitivities associated with the modeled system. While the PA will reflect the modeled system results from the best available information, it will also identify areas for future work to reduce overall PA uncertainties moving forward. DOE requires a PA Maintenance Program such that work continues to reduce model uncertainties, thus bolstering confidence in PA results that support regulatory decisions. This maintenance work may include new Research and Development activities or modeling as informed by previous PA results and other new information that becomes available. As new information becomes available, it is evaluated against previous PAs and appropriate actions are taken to ensure continued confidence in the regulatory decisions. Therefore, the PA program is a continual process that is not just the development of a PA but seeks to incorporate new information to reduce overall model uncertainty and provide continuing confidence in regulatory decisions.

INTRODUCTION

The SRS is a DOE site located in south-central South Carolina, approximately 161 kilometers (100 miles) from the Atlantic Coast. The major physical feature at SRS is the Savannah River, approximately 32 kilometers (20 miles) of which serves as the southwestern boundary of the site and the South Carolina-Georgia border. The SRS includes portions of Aiken, Barnwell, and Allendale Counties in South Carolina. The SRS occupies an almost circular area of approximately 803 square kilometers (310 square miles) and contains production, service, and research and development areas. The Liquid Waste facilities are located in the industrialized central portion of the site known as the General Separations Area (GSA) as depicted in Figure 1. The Saltstone Disposal Facility, Z Area, is an approximately 650,000 m^2 (161 acres) facility located in the northeast of the GSA. The F-Tank Farm (FTF) is approximately 90,000 m^2 (22 acres) located in the southwest portion of the GSA and the H-Tank Farm (HTF)is approximately 180,000 m^2 (45 acres) located in the southeast portion of the GSA.

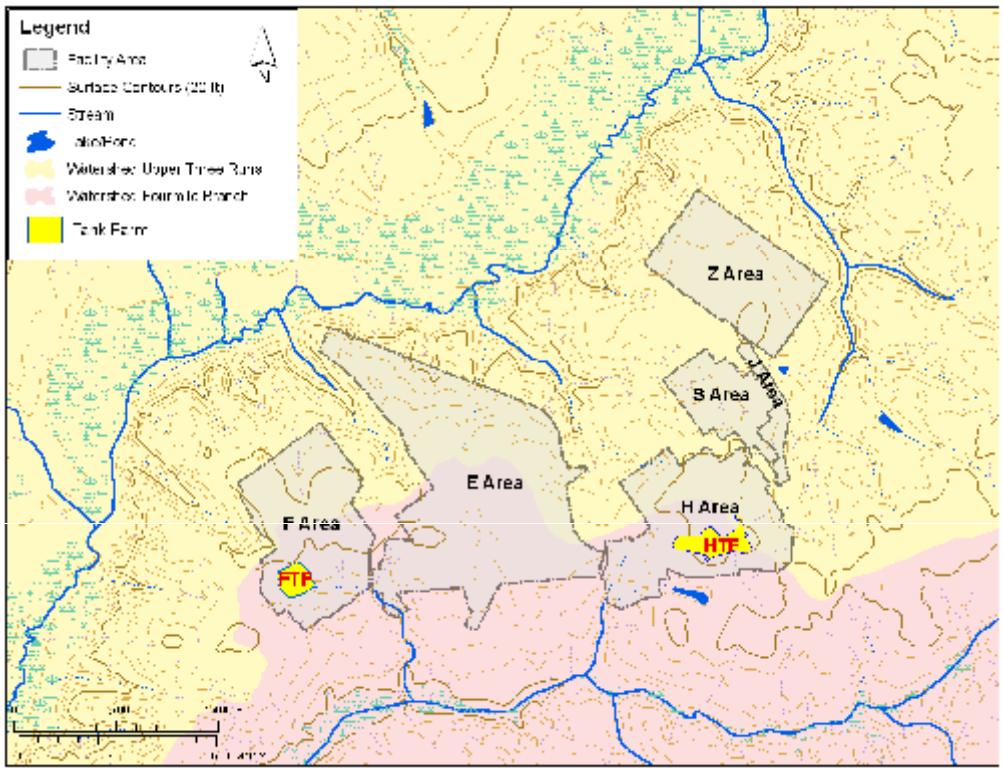

Fig. 1. SRS General Separations Area.

Each of the Liquid Waste facilities have a PA which serves as the key technical basis for information on the anticipated features of the closed facilities and associated modeling results including groundwater concentrations and air concentrations for numerous contaminants and radiological dose results using various exposure pathways. These results are presented for various points of assessment and for long periods of time after closure to gain understanding of the modeled system. The Saltstone Disposal Facility PA is a second generation PA with the

initial developed in 1992 and a recent revision in 2009 [1]. The tank farm PAs are first generation PAs with the latest revision for the FTF PA completed in 2010 [2] and for the HTF PA in 2012 [3].

PA PROCESS

Conceptual Model Development

When the need for a new PA or PA revision is identified, one of the first activities necessary is to develop a conceptual model that best represents the known facility attributes and the anticipated closure attributes. The known facility attributes may include the physical dimensions and conditions of the tanks or disposal units, information about the natural system in which the engineered features reside and characterization of the material disposed of in saltstone or residual materials in already emptied tanks. The anticipated attributes may include any planned closure/cover system or cap meant to minimize and delay future water infiltration to the closed system and estimates of future disposal or residual material characteristics. The conceptual model would also include estimates of the changes in the modeled attributes over time as the engineered materials degrade. All of these modeling parameters would be based upon the best information available at the time which may include actual testing results, literature information or best engineering judgment as informed by available data. The conceptual model development process would also include alternative conceptual models that will inform closed system understanding by identifying the impacts of potential uncertainties and sensitive modeling parameters. The conceptual model provides the overall foundation for modeling activities for the PA and thus a significant portion of a PA may be in the presentation of the conceptual model development and input parameters. Figure 2 presents an example modeling framework which would require parameters for each model segment.

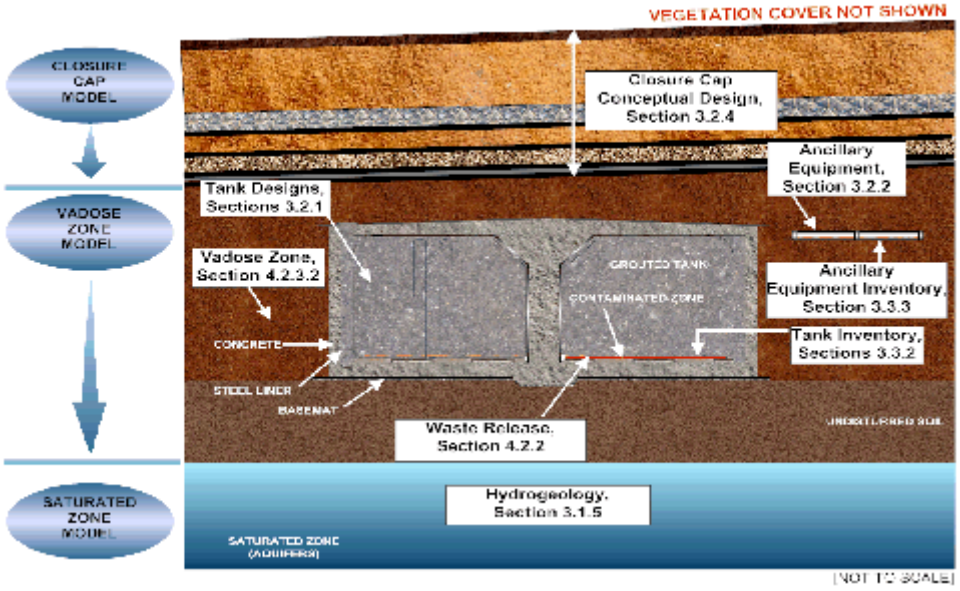

Fig. 2. Example Conceptual Model Framework.

PA Development

The PA itself provides the basis for the conceptual models and the results of the modeling activities. Results are provided not only for the case that is based on the best available information (i.e., the Base Case) but also for the alternate conceptual models that improve the understanding of the modeling results. Uncertainty and sensitivity analyses provide additional understanding of the modeled system, with respect to the potential risks associated with the system, such that decision-makers can make informed decisions. The PA identifies the potential uncertainties and sensitive model parameters and is used to identify areas for future work. DOE regulatory guidance then directs the incorporation of a PA Maintenance Program to reduce the known uncertainties to ensure the risks associated with the disposal or closure actions are mitigated.

PA Maintenance

The PA Maintenance Program is an on-going process meant to reduce the identified uncertainties and evaluate any new information that becomes available during disposal or closure operations. Identified uncertainties may be addressed by additional research and testing or modeling activities. New information may result during operations that are different from the parameters and assumptions used in PA development. In either case, a program must be in place to evaluate the information to ensure that the activities remain compliant with regulatory performance objectives, key stakeholders remain informed and that decisions made previously are still valid or actions need to be taken.

For the Liquid Waste facilities at SRS, an annual PA Maintenance Program Plan is developed to document work completed in the previous year and to identify plans for work to be completed in the current year. Figure 3 presents an example from the fiscal year 2012 PA Maintenance Plan that identifies key conceptual model areas and specific parameters of interest associated with the model area in order to inform work planning. Figure 4 presents an example of the on-going efforts associated with a specific conceptual model area and how past work can inform future needs to address modeling uncertainty. This specific example illustrates that some issues can take several years to reach resolution as individual tasks may take a year or more complete. The development of an annual plan allows for a thoughtful evaluation of the overall PA uncertainty as informed by the work completed or new information that has become available in the previous year. Therefore, items that were part of the previous plan can change or be eliminated or new items added to the plan as necessary. The act of development of an annual plan forces the PA analysts to pause and consider the total picture in PA uncertainty not only within a specific facility but how the new information may impact other Liquid Waste facility PAs. In this way, the PA Maintenance Program can leverage testing that has the potential to reduce uncertainties in multiple facilities. DOE guidance also requires that the need for a PA revision is continually evaluated based on new information obtained and if facility designs, waste streams or other information changes to warrant a revision. If a revision is warranted, the cycle is repeated with the development of a new conceptual model.

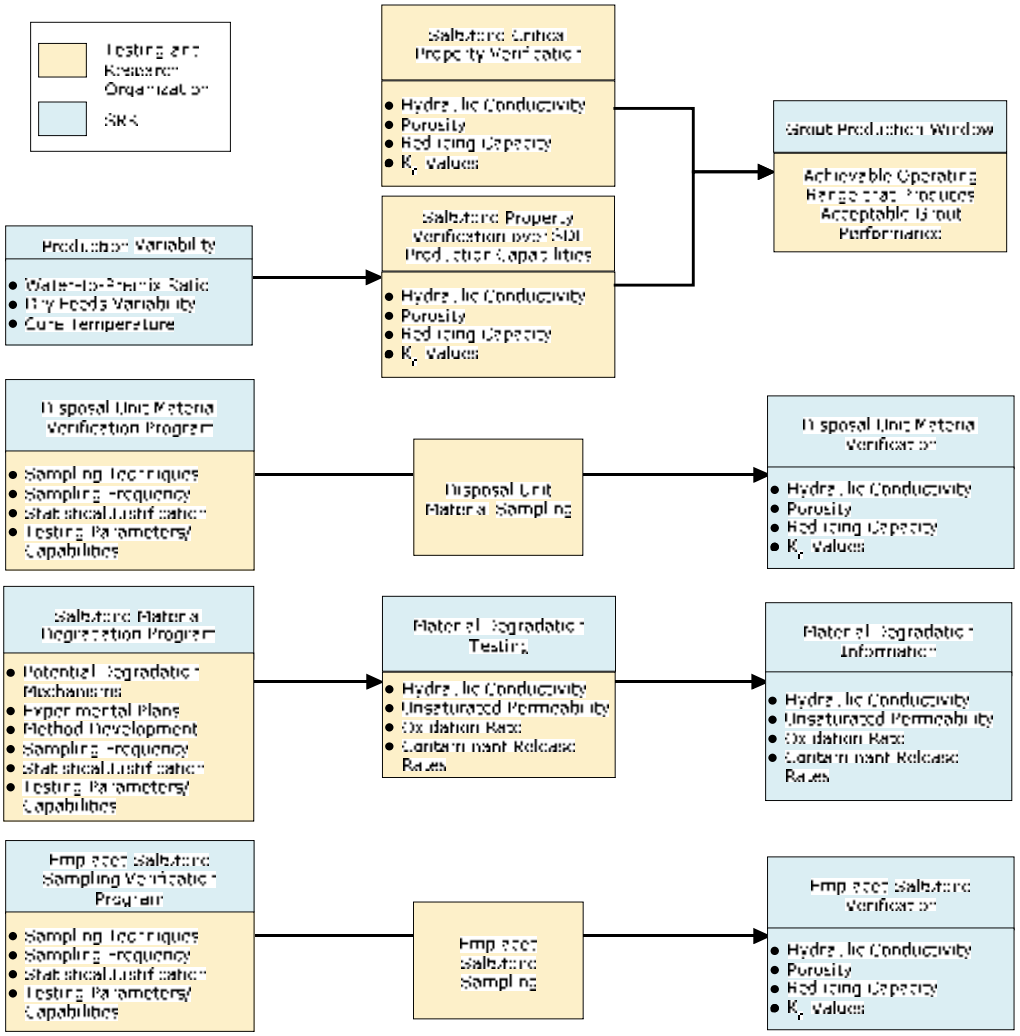

Fig. 3. Example of Key Conceptual Model Areas and Parameters of Interest.

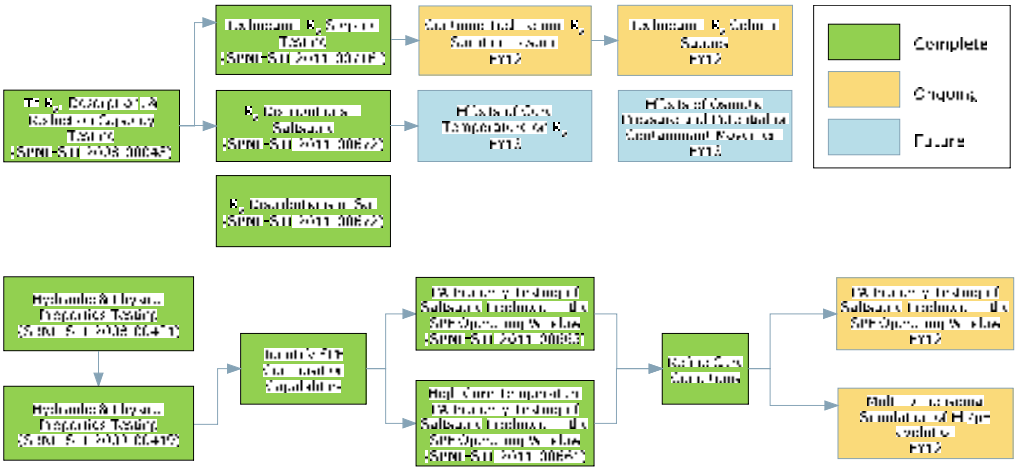

Fig. 4. Example of Specific Conceptual Model Areas Issue Resolution Flowpath.

CONCLUSION

In conclusion, the Liquid Waste PA program at SRS represents a continual process over the life of disposal and closure operations. The process includes the development of facility conceptual models, computer modeling activities and evaluation activities, PA development and interpretation of results and an on-going PA Maintenance Program striving to reduce identified uncertainties and evaluate new information. The PA program is a continual process that begins with a PA but seeks to incorporate new information to reduce overall model uncertainty and provide continued confidence in regulatory decisions.

REFERENCES

1. SRR, *Performance Assessment for the Saltstone Disposal Facility at the Savannah River Site*, Revision 0, Savannah River Site, Aiken, SC (2009).
2. SRR, *Performance Assessment for the F-Tank Farm at the Savannah River Site*, Revision 1, Savannah River Site, Aiken, SC (2010).
3. SRR, *Performance Assessment for the H-Area Tank Farm at the Savannah River Site*, Revision 1, Savannah River Site, Aiken, SC (2012).