

**SYSTEMS PERFORMANCE ASSESSMENT PLAN FOR THE MANAGEMENT OF
US DEPARTMENT OF ENERGY SAVANNAH RIVER SITE
LOW LEVEL RADIOACTIVE WASTES**

Anthony C. Rutz,
Wastren, Inc.
Idaho Falls, ID
and
John Harley
Westinghouse Savannah River Co.
Aiken, SC

ABSTRACT

This Plan for the Systems Performance Assessment (SPA) of Savannah River Site (SRS) Low Level Radioactive Waste (LLW) describes the purpose, objectives, and goals of a systems performance assessment, as well as the requirements, the philosophy, the steps to be taken, and the tasks necessary to implement a LLW system which accomplishes the goals. The identified elements of the plan meet the intent of the LLW SPA requirements of DOE 5820.2A, per "Guidance for Conduct of Waste Management Systems Performance Assessment," (DOE/LLW-63T, Revision 1). This Plan was preceded by a LLW System Definition Report prepared to provide the baseline SRS LLW stream characterization and inventory, disposal source term, existing and committed waste management system components, and an evaluation of applicable regulations.

The SPA consists of a collection of performance assessments, each conducted on a discernable component of the LLW management system. Each is viewed from the perspective of its effect (contribution) on the overall goal of meeting or exceeding the site performance objectives. Collectively they form an integrated assessment of the entire LLW system performance, and an effective technology-based tool with which to proactively manage SRS LLWs. Thus, compliance with the DOE Order 5820.2A can be implemented on the required systematic basis.

This SPA Plan also identifies the necessary activities, decisions, and accomplishments, as well as the schedule for the SPA. A more quantitative, on-going system performance assessment for the Savannah River Site will follow the collection of pertinent waste characterization data on the LLW stream, and the near-term completion of the pending LLW radiological performance assessments. The timeliness and completion of the data collection and radiological performance assessment is imperative for early implementation of the SPA. Similarly, implementation of the SPA will provide early identification of improvements and corrective actions to the existing LLW system.

INTRODUCTION:

The US Department of Energy (DOE) philosophy for LLW management has broadened from one which has historically relied on disposal site requirements and characteristics to contain the radionuclides, to one which includes the technological developments in waste reduction, treatment, conditioning, packaging, storage, and disposal options borne out of facility operations and management experience. This change in philosophy has occurred because:

- The costs associated with new disposal site development mandate preserving existing disposal capacity.
- Rising costs of remedial actions and long term maintenance can be reduced by improved LLW management practices.
- Shallow land burial of LLW is not in itself a guarantor of radioactive and hazardous materials confinement or containment.

With the implementation of DOE Order 5820.2A of 9-26-88 came a new, more detailed, prescriptive, and performance objective-oriented regulation for managing DOE wastes, patterned after the counterpart regulations promulgated by the Nuclear Regulatory Commission (NRC) and the Environmental Protection Agency (EPA). One of the most significant "new" requirements in the Order is the Systems Performance Assessment of DOE's LLW management system (III-3.b(2)). The Systems Performance Assessment, herein after entitled the SPA, is a systematic analysis of the potential risks posed to the public and the environment by the LLW management systems (waste generation reduction, segregation, treatment, packaging, storage, and disposal), and a comparison of those risks to established performance objectives.

The SPA Plan is designed to address current status of the LLW system, and to project future conditions of the LLW system for as long as potentially significant radiological impacts may exist. That the performance objectives and waste management technologies will generally improve over time serves to both compel and justify an on-going assess-

ment of the operating LLW systems at SRS. The opportunity to view LLW management both qualitatively and quantitatively over time, within the objectives of progress, environmental stewardship, and cost effectiveness, will undoubtedly enhance the planning for improvements in the LLW management system.

This SPA Plan describes the tasks necessary to initiate, conduct and sustain a systematic assessment of the SRP LLW System performance, the findings of which will be factored into overall planning of waste management activities.

Overview of the Systems Performance Assessment

The purpose of this SPA plan for SRS is to detail the steps necessary for successful completion of the SPA. It provides a methodology for the selection of appropriate technologies for the effective management of SRS's LLW. In so doing, each step of the LLW process, including costs for long-term activities (such as site monitoring, corrective actions, institutional control, etc.), and short-term activities (such as facility development, waste treatment, transportation, etc.) must be assessed for effects on the operation of the LLW management facilities. Implementing the SPA process described herein should assure achievement of these goals:

- Preserve existing disposal capacity
- Maximize assurance that the performance objectives are met
- Ensure that the LLW Management technologies used or planned are compatible with site environmental characteristics.
- Reduce the long-term costs of operating the LLW Management System
- Establish an on-going program of compliance with the SPA requirements of DOE Order 5820.2A, specifically Section III.3.b.2.

SRP's LLW MANAGEMENT SYSTEM

Figure 1 illustrates the current LLW System in place at SRS, including the waste stream flow paths and waste treat-

ment, storage, and disposal facilities. Nine different SRS departments generate LLW:

1. Waste Management
2. Laboratories
3. Reactors
4. Naval Fuel
5. Raw Materials
6. Separations
7. Tritium
8. Site Services
9. SRL

Planned upgrades for SRP's LLW operations include a number of facility additions. Figure 2 depicts the LLW stream flow paths following completion of these planned facilities.

PERFORMANCE OBJECTIVES AND ASSESSMENTS

SRS is approaching compliance with performance objectives specified in DOE Order 5820.2A, Sections III.3.a and .a(2) (which requires that external exposure to waste and concentrations of radioactive material released into the accessible environment not exceed 25 mrem/year exposure to any member of the public). Completion of the new SRS LLW facilities are needed to meet these requirements. For Saltstone, the Safety Analysis Document (SAD) will be upgraded to a Safety Analysis Report (SAR), and the design criteria evaluation will be completed. As noted earlier, the radiological performance assessment of the Burial Ground Expansion is currently being conducted, and is scheduled for completion in FY 90. An on-going performance assessment is being conducted for Z Area. Other performance assessments for Y Area and the new HW/MWDF will be scheduled and conducted as resources are identified, although both of these areas will be subject to the provisions of the Resources Conservation and Recovery Act (RCRA) and will be "zero release facilities."

It has not been determined at this time whether the State of South Carolina has regulations in place (or pending) which may impose additional limitations on the LLW

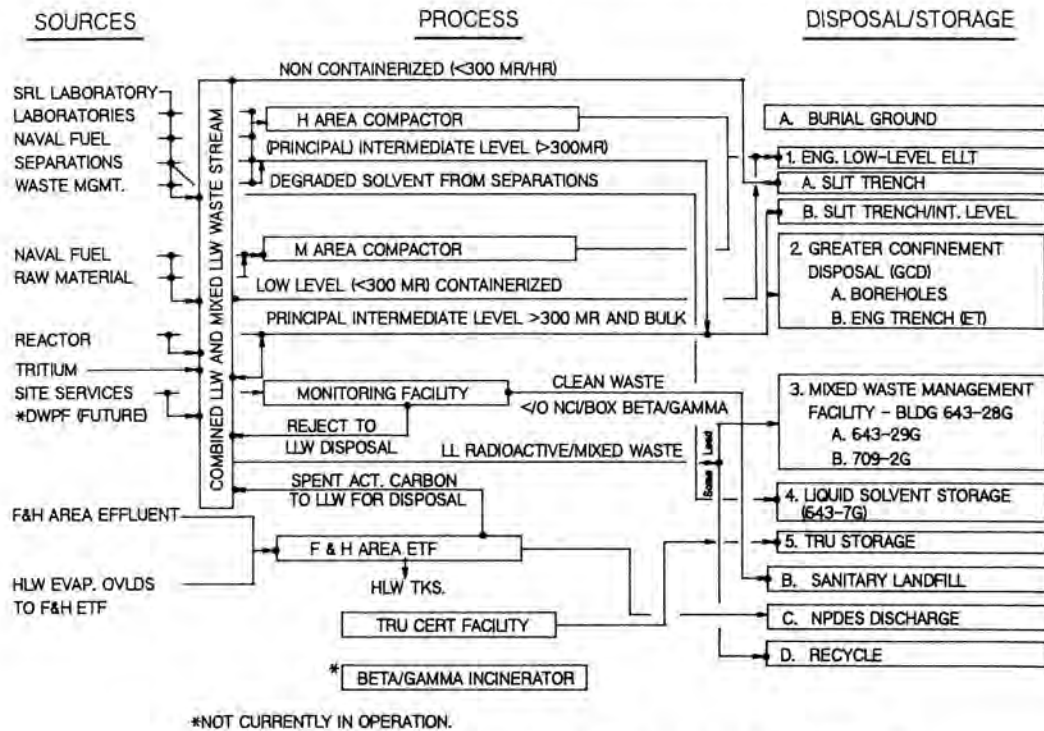


Fig. 1. Savannah River Site Current LLW and Mixed LLW Waste Flow.

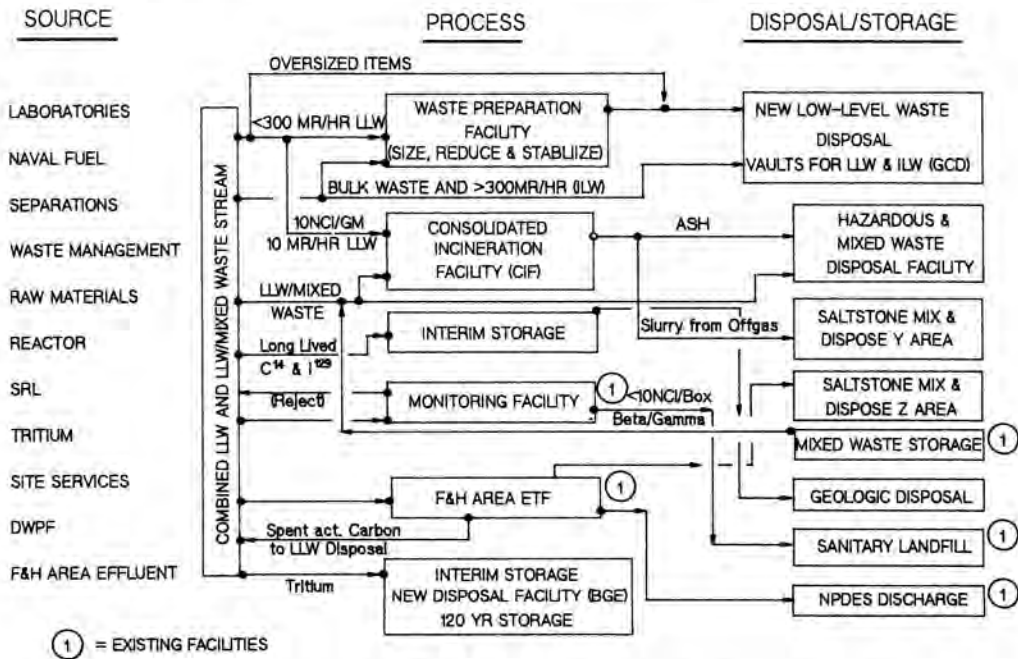


Fig. 2. Savannah River Site Planned LLW and LLW/Mixed Waste Flow Overview.

activities at SRS. Such a determination will be essential in completing the performance objectives for SRS.

THE SYSTEMS PERFORMANCE ASSESSMENT

The six steps required for the SPA are summarized below.

- **STEP 1 DETERMINATION OF REGULATORY REQUIREMENTS**

The purpose of this step is to perform a regulatory analysis of pertinent Federal, state, and local regulations to determine impact on LLW facility performance objectives, specifically those regulations, or pending legislative initiatives, which could influence radiological dose limits.

- **STEP 2 DETERMINATION OF THE MAXIMUM LLW SOURCE TERM**

The maximum LLW source term is a hypothetical maximum limit set for each disposal site, optimized by the site-specific environmental factors to represent the maximum concentration of radionuclides which can be disposed.

- **STEP 3 DETERMINATION OF COMPONENTS OF THE LLW SYSTEM**

This step is required to determine the integrated LLW system components which may be needed to reduce waste inventory projections and, in turn, to meet the performance objectives. The purpose is to determine which engineered barriers and predisposal treatment techniques will optimize disposal capacity within the maximum source term and performance objectives.

This task represents the major effort involved in conducting the SPA.

- **STEP 4 DETERMINATION OF THE BASE SYSTEM COST PERFORMANCE LEVEL**

The purpose of this step is to determine the costs for the existing LLW system, and the costs for planned improvements to meet the the performance objectives.

- **STEP 5 DETERMINATION OF THE PREFERRED LLW SYSTEM USING ALARA AND COST-BENEFIT ANALYSIS**

This step is required to supplement the base cost-performance level determined in Step 4, (i.e. those cost associated with the disposal site meeting the performance objectives), with costs required to reach ALARA.

- **STEP 6 IMPLEMENTATION OF THE PREFERRED LLW SYSTEM**

The final step in this System Performance Assessment process is to implement the preferred LLW system, based squarely on the DOE revised, technology-, safety-, and

economically-based policy for waste management activities, ranging from site development, to operation, out through closure.

KEY ACTIVITIES, DECISIONS, ACCOMPLISHMENTS AND SCHEDULE

The key activities, decisions, accomplishments and schedule for initiating the SPA at SRS are depicted in Fig. 3.

In general, the activities needed to commence the SPA include:

- Analysis of South Carolina's radioactive and hazardous/mixed waste regulatory requirements; comparison with Federal requirements.
- Identification and characterization of each specific SRS process waste stream component.
- Establishment and implementation (on a specific schedule) of formal Waste Minimization and Certification Programs per the requirements noted in 5820.2A.
- Planned waste treatment, storage, and disposal activities are being re-assessed in light of the cost-benefit analysis requirements of 5820.2A.
- Verification of the acceptable NEPA compliance status (as noted in the SRS Implementation Plan for compliance with 5020.2A) of the proposed Burial Ground Expansion.
- Implement upgrades to the COBRA System to ensure all data required by 5820.2A are collected and maintained as the SPA proceeds.
- Determine the maximum SRS source term for historical waste management activities.

Thereafter, the SPA process as set forth should be continued (as noted in Fig. 3). The requirement to maintain the SPA warrants early establishment of a data base developed specifically for the SPA, including all the specific component data as noted in the Order, and including trend analysis.

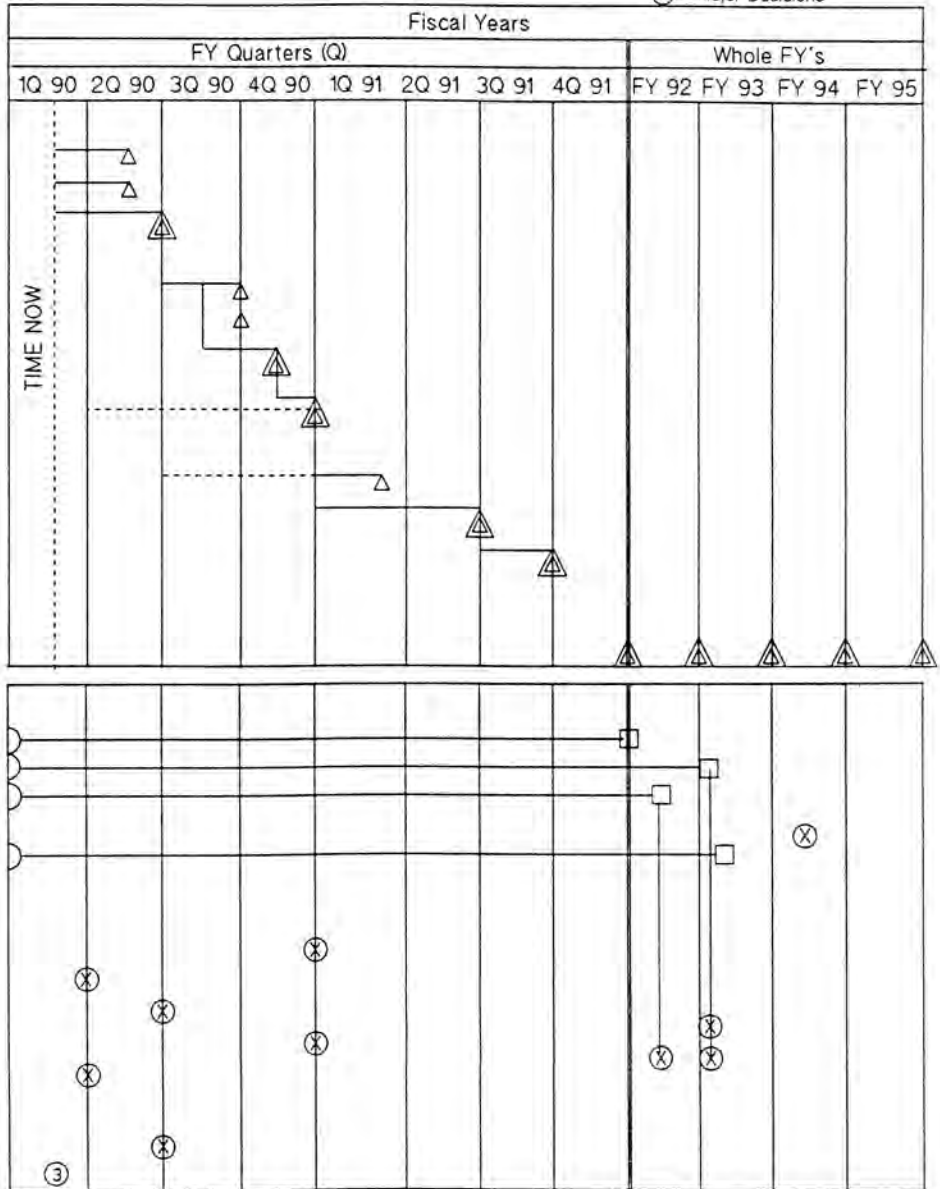
CONCLUSION:

The Systems Performance Assessment Plan has a dual purpose. It provides the opportunity to retrospectively assesses the past radioactive (and hazardous) waste management practices at SRS using today's standards and techniques. In this way, it serves as a report card of past practice. But its most significant benefit is that it both affords and compels systematic, prospective and continual re-evaluation: an action plan for successful LLW management, both for the near term and in perpetuity.

Key Activities, Decisions, Accomplishments

- = On-Going
- △ = SPA Task Completion
- ▲ = Major SPA Accomplishments
- = Major Decisions

KEY ACTIVITIES
SPA STEPS/TASKS



¹ On going SPA activities to be determined at end of each preceeding cycle (Steps 1-6)

² 5820.2A LLW Requirements not listed are presumed to be in compliance at SRS.

³ Cobra upgrades scoped - no schedule for implementation developed.

- ⊔ = Proj. Auth. before FY 90
- ⊗ = Planned Proj Authorization
- = Planned Project Completion

Fig. 3. SRS System Performance Assessment Schedule.