

**DEPARTMENT OF ENERGY-SAVANNAH RIVER PROGRAM  
FOR COMPLIANCE WITH THE RESOURCE CONSERVATION AND RECOVERY ACT**

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**ABSTRACT**

The Savannah River Plant (SRP) is a major Department of Energy (DOE) installation that produces nuclear materials for defense and research purposes and currently generates hazardous and mixed waste. Past management practices for such waste have included disposal in seepage basins and storage in interim storage facilities. As with other industrial and federal facilities, DOE-Savannah River (DOE-SR) waste management operations have changed over the years due to increased environmental awareness and changing environmental regulations, in particular, the complex requirements of the Resource Conservation and Recovery Act (RCRA).

This paper discusses actions taken and planned, by DOE-SR, at the SRP to achieve compliance with the requirements of the RCRA and subsequent amendments, including:

- the construction of two wastewater treatment facilities to treat process wastewater;
- the construction of a consolidated incineration facility to treat stored and newly generated hazardous and mixed waste;
- the construction of a hazardous and mixed waste disposal facility for treated hazardous and mixed waste; and,
- the construction of a processing facility to treat high level radioactive mixed waste.

**INTRODUCTION**

The Savannah River Plant (SRP) is a 300-square mile Department of Energy (DOE) installation located near Aiken, South Carolina. SRP's primary function is the production of plutonium, tritium, and other special nuclear materials for national defense, for other government uses, and for some civilian purposes. Due to increased environmental awareness and more stringent environmental regulations, the DOE-Savannah River (SR) strategy for the management of hazardous and mixed waste has changed significantly over the past ten years. DOE-SR is transitioning the waste management program to focus on waste reduction and treatment rather than storage and disposal of untreated waste. As an integral part of the changing waste management strategy, the DOE-SR has instituted five major waste management projects at SRP to treat and/or dispose of hazardous and mixed waste generated on site and will have spent over one billion dollars by 1993 on the design and construction of the projects.

**REGULATORY HISTORY**

In 1976, Congress passed the Resource Conservation and Recovery Act (RCRA) to provide a national program for the management, i.e., storage, treatment, transportation, and disposal, of hazardous waste.

In November 1984, Congress passed the Hazardous and Solid Waste Amendments (HSWA) which strengthen

the RCRA regulations to include the following substantial requirements:

- Phased restrictions on the land disposal and indefinite storage of untreated hazardous waste; and
- Restrictions on the use of surface impoundments and landfills not meeting minimum technological standards.

The 1976 RCRA requirements specifically excluded source, special nuclear, and byproduct material as defined by the Atomic Energy Act (AEA) of 1954 and activities or substances regulated by the AEA if RCRA requirements are inconsistent with the AEA.

In order to clarify the confusion regarding RCRA's applicability to mixtures of hazardous waste and radioactive materials, the DOE issued a final rule in May 1987 which stated that waste containing both hazardous waste and radioactive waste are subject to AEA and RCRA regulation.

The combination of requirements under the RCRA and the HSWA provides a comprehensive regulatory program for the management of both hazardous and mixed waste. These requirements include the following major provisions:

- Methods for identification and classification of hazardous waste;
- Requirements for packaging and shipping hazardous waste;

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- Standards for the design, operation, and closure of hazardous waste treatment, storage, and disposal facilities;
- Standards for the operation of facilities recycling and reusing hazardous waste;
- Restrictions on the land disposal of hazardous waste; and
- Requirements for permitting hazardous waste management facilities and transporters.

The focus of the current RCRA and HSWA requirements is to encourage waste minimization, waste treatment to reduce the volume and toxicity, and permanent disposal of treated waste.

#### WASTE GENERATION AND PAST PRACTICES

The SRP operations generate a variety of hazardous and mixed waste which are subject to the RCRA and HSWA requirements. For the purposes of this paper, the waste can be segregated into two broad categories:

- Combustible waste; and
- Non-combustible waste.

Examples of these types of waste are shown in Table I.

TABLE I

Types Of Hazardous And Mixed Waste Generated At Srp

Combustible Waste	Hazardous Waste	Mixed Waste
Waste Oil	X	X
Contaminated Soil	X	
Paint Waste	X	
Spent Solvents	X	
Scintillation Fluids		X
Non-combustible Waste		
Process Waste Water		X
Contaminated Process Equipment		X
Lead Shielding		X
Spent Filters, Resins		X
High Level Radioactive Waste		X

Figure 1 depicts the SRP hazardous and mixed waste program in 1984. As shown in this figure, high level radioactive waste was stored in carbon steel underground storage tanks, process wastewater was disposed of in unlined seepage basins, and the remaining combustible and non-combustible waste was stored in Butler-type storage buildings.

Although these waste management practices were industry-accepted at the time of implementation, DOE-SR recognized that these practices should be altered to provide a higher degree of environmental protection, and meet

impending regulatory requirements. Therefore, DOE-SR redirected the waste management program at SRP to:

- Reduce the generation of waste;
- Reduce the volume and toxicity of waste in storage and currently generated;
- Provide environmentally sound permanent disposal facilities at SRP; and
- Comply with all current and anticipated regulatory requirements.

#### WASTE MANAGEMENT PROJECTS

To achieve these objectives the following five major waste management projects have been, and are being, instituted by DOE-SR at SRP:

- M-Area Liquid Effluent Treatment Facility (LETF);
- F and H-Area Effluent Treatment Facility (ETF);
- Defense Waste Processing Facility (DWPF);
- Consolidated Incineration Facility (CIF); and,
- Mixed Waste/Hazardous Waste Disposal Facility (MW/HWDF).

Construction was initiated on the first of the five projects, the LETF, in 1984 and will be complete in 1993 with the completion of the MW/HWDF.

The LETF and ETF are two facilities which treat primarily non-combustible, process wastewater containing low level radioactivity and non-radioactive hazardous materials, and cooling and storm water, contaminated with radioactivity, to within limits acceptable for discharge to natural streams.

The LETF receives concentrated chemical waste and process wastewater which is treated by equalization, evaporation, filtration, and flocculation to remove hazardous constituents. The LETF began operation in July 1985. The ETF was placed on-line in November 1988 to receive routine process wastewater effluents and nonroutine discharges of moderately contaminated cooling water and storm water. Through a combination of filtration, reverse osmosis, and ion-exchange, contaminants are reduced to levels acceptable for discharge to surface streams. Hazardous and mixed waste treatment residues from these facilities, such as filters and resins, are currently being stored awaiting disposal in the MW/HWDF. Prior to the operation of these treatment facilities, process waste water, cooling water, and storm water was discharged to eight seepage basins.

Currently DOE-SR stores high level radioactive waste in 51 underground storage tanks. The DWPF will treat this non-combustible, high level radioactive waste through a vitrification operation to form a non-hazardous, stable, borosilicate glass matrix. The glass matrix will be contained in stainless steel canisters which will be stored in an on-site vault at SRP pending availability of a federal repository for permanent disposal. Before the high level radioactive waste is introduced to the melter for the vitrification process aromatic hydrocarbons are removed from the material through a formic acid hydrolysis process. The combustible

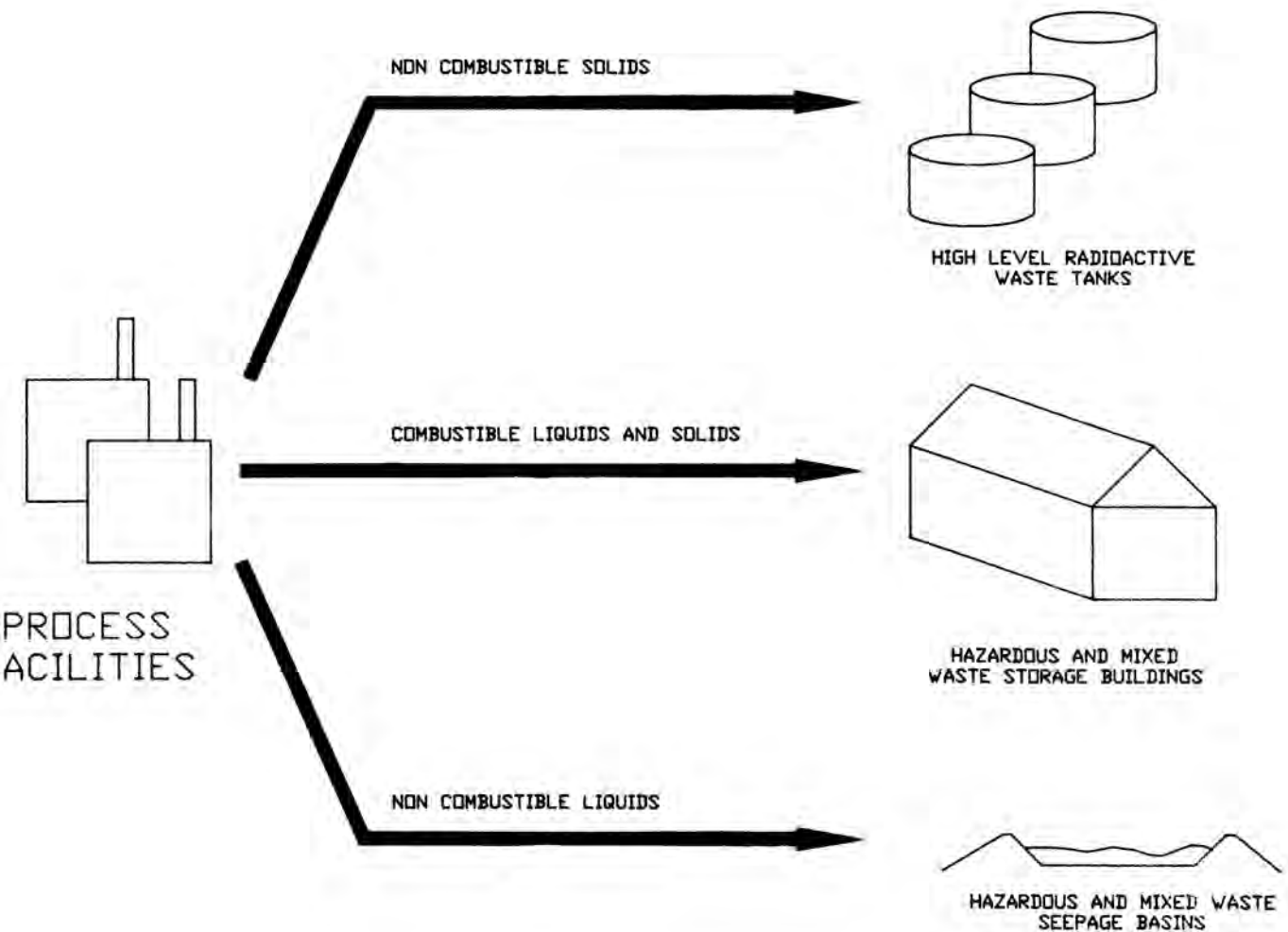


Fig. 1. Previous DOE-SR Waste Management Program.

aromatic hydrocarbons generated by the DWPF will be sent to the CIF for incineration. Construction of the DWPF began in the fourth quarter of FY 1984 and hot operations will begin by the second quarter of FY 1992.

As shown in Fig. 1, solid and liquid combustible hazardous and mixed waste is currently stored in five storage buildings. The CIF will provide for detoxification and volume reduction of this waste through a rotary kiln, secondary combustion chamber, and wet off-gas scrubbing system. Hazardous and mixed waste treatment residues, such as ash, from the CIF will be sent to the MW/HWDF for disposal. Construction of the CIF is scheduled to begin in the second quarter of FY 1990, with completion scheduled in the third quarter of FY 1992.

Non-combustible waste is also currently stored in the five storage buildings. After appropriate treatment, this waste will be permanently disposed of in the MW/HWDF. The MW/HWDF will be an above-grade, reinforced concrete vault disposal facility for non-combustible solid waste and waste residue.

Containerized waste will be stacked in the vaults and reinforced concrete roofs placed on the vaults when filled to capacity. At closure the entire facility will be mounded with a natural soil cover to ensure long-term isolation of the wastes. Construction of the MW/HWDF is expected to begin the first quarter of FY 1990, with the first vault complete the second quarter of FY 1993.

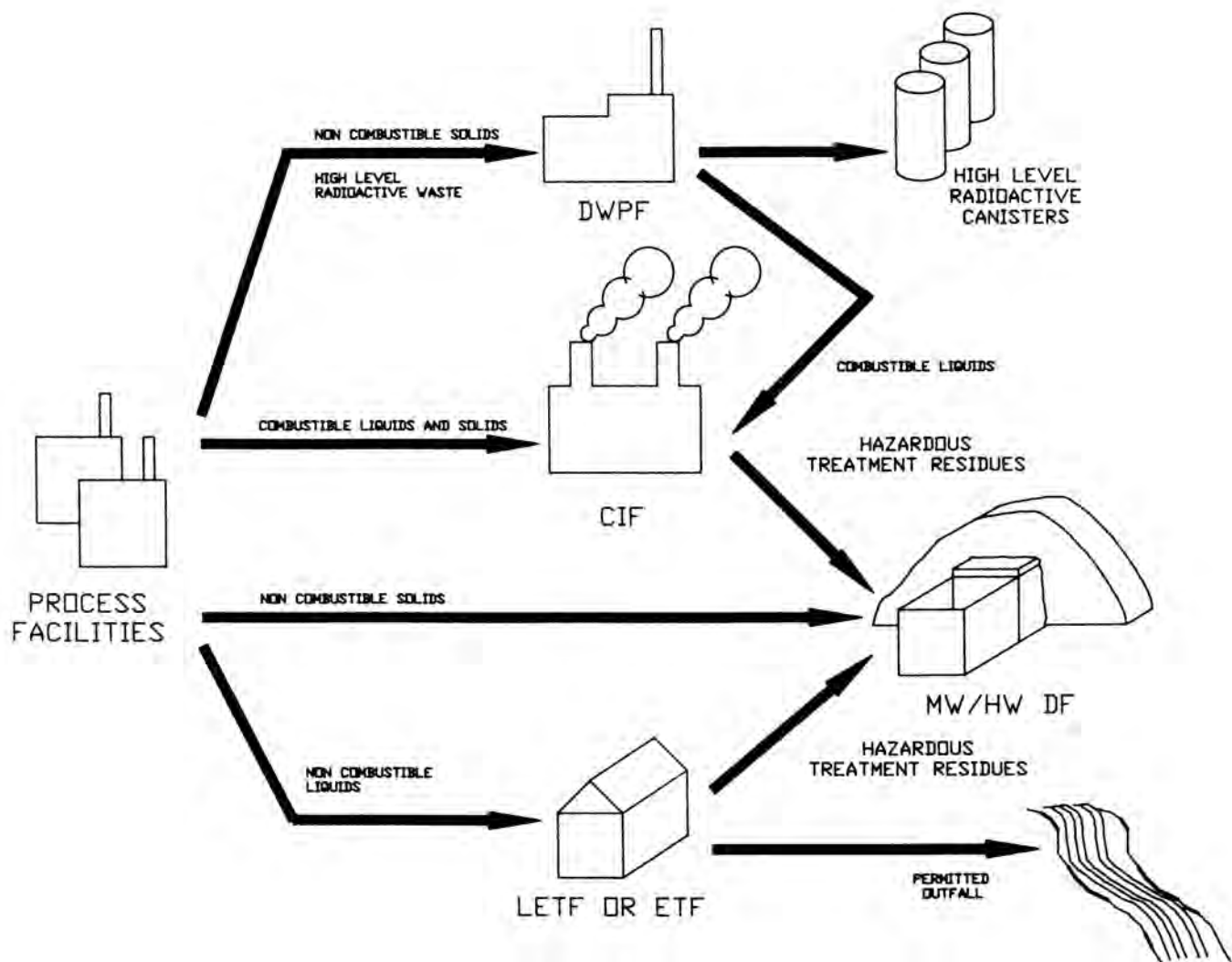


Fig. 2. Future DOE-SR Waste Management Program.

Figure 2 depicts the future hazardous and mixed waste program at SRP and the integration between the five facilities described above.

Operation of these five facilities will allow DOE-SR to meet their objective for the SRP waste management program and comply with the RCRA and 1984 HSWA requirements by:

- Reducing the volume and toxicity of waste through treatment in the LETF, ETF, CIF, and DWPF;
- Discontinuing the use of seepage basins, as required by the 1984 HSWA, by rerouting process wastewaters to the LETF and ETF;

- Eliminating indefinite storage of waste in storage buildings and underground tanks, as required by the 1984 HSWA, through treatment in the CIF and DWPF; and
- Providing permanent isolation of treated waste material by disposal in the MW/HWDF.

**PROJECT COSTS**

The total estimated costs (TEC's) for the individual projects are shown in Table II.

**CONCLUSION**

By 1993, DOE-SR will have implemented five major waste management projects with expenditures totaling over

one billion dollars. (This represents only a portion of the entire DOE-SR obligation for compliance with the RCRA and HSWA requirements.)

Completion and implementation of these projects will strengthen the environmental program at SRP and achieve compliance with the RCRA and HSWA requirements by:

- Eliminating use of seepage basins and phasing out storage of mixed waste in underground tanks;
- Eliminating the indefinite storage of untreated hazardous and mixed waste;
- Reducing the volume and toxicity of the hazardous and mixed waste in storage and currently generated; and
- Providing environmentally sound treatment and disposal facilities for hazardous and mixed waste which meets the RCRA and HSWA minimum technology standards.

**TABLE II**

Total Estimated Costs of DOE SR Projects at SRP

Project	TEC (\$ x 1E 6)
M-Area Liquid Effluent Treatment Facility	\$25
F and H Area Effluent Treatment Facility	\$50
Defense Waste Processing Facility	\$930
Consolidated Incineration Facility	\$42
Mixed Waste/Hazardous Waste Disposal Facility	\$19.5
Total	\$1,066.5

These initiatives demonstrate the DOE-SR commitment to ensure protection of the environment and an

aggressive effort towards achieving full compliance with the RCRA and HSWA regulatory requirements.

**REFERENCES**

1. U.S. DEPARTMENT OF ENERGY, 1987, Final Environmental Impact Statement, Waste Management Activities for Groundwater Protection, Savannah River Plant, Aiken, S.C., Vol. I, DOE/EIS-0120, Savannah River Operations Office, Aiken, South Carolina.
2. U.S. DEPARTMENT OF ENERGY, 1988, Savannah River Waste Management Operations Program Plan-FY-1989, DOE/SR-WM-89-1, Savannah River Operations Office, Aiken, South Carolina.