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HLW-OVP-94-0145

High Level Waste Management Division

HLW System Plan Revision 4 (U)

Westinghouse Savannah River Company
Aiken, South Carolina

November 30, 1994

707560

Westinghouse
Savannah River Company

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Mr. Steven D. Richardson, Assistant Manager
High Level Waste
U. S. Department of Energy
Savannah River Operations Office
P. O. Box A
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Dear Mr. Richardson:

HIGH LEVEL WASTE SYSTEM PLAN, REVISION 4 (U)

Attached is the final version of the HLW System Plan, Revision 4. The reason for this revision is to align the Plan with the current FY95 Annual Operating Plan and the funding guidance provided for FY96 - FY00 as provided by DOE-HQ. There are several improvements incorporated into this Plan as compared to Revision 3. Additional improvements are already in progress for Revision 5. It is anticipated that this Plan will be revised and issued again as Revision 5 after the FY97 Five Year Plan is finalized which is currently projected to occur in May 1995.

Questions or requests for additional information regarding this Plan should be directed to S. S. Cathey at 5-3052 or N. R. Davis at 5-1246 of my staff.

Sincerely,

C L Patiparu For
A. B. Scott, Jr.
Vice President and General Manager
High Level Waste Management Division

NRD:nrd/jbm

Att.

HLW-OVP-94-0145, HLW System Plan, Revision 4 (U), November 30, 1994

Approval Sheet

C L Peckinpaugh
C. L. Peckinpaugh
Deputy General Manager
High Level Waste Management
Westinghouse Savannah River Company

11/23/94
Date

A. D. Richardson
for R. J. Schepens
Acting Deputy Assistant Manager, High Level Waste
U.S. Department of Energy, Savannah River Field Office

11/29/94
Date

H. B.
for R. E. Erickson
Director, Vitrification Projects Division
U. S. Department of Energy, Headquarters

11/29/94.
Date

DISCLAIMER

The system plan is a planning tool only. Final decisions on work to be performed during a given year, and key completion milestones will be made as part of the Budget Finalization Process. The base case identified in this version of the plan identifies those areas where additional productivity, cost reduction and/or funding will provide measureable benefits to the program.

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Executive Summary

This High Level Waste System Plan describes the current operational strategy for the management of the Savannah River Site's High Level Waste System. The reference date of this Plan is September 30, 1994. Operating constraints, planning bases, issues, assumptions, schedules, contingency analyses and other pertinent information are current as of that date. The plans described herein are under continual review by the Westinghouse Savannah River Company and the Department of Energy, and are subject to change accordingly. Subsequent revisions of this document will occur following any significant change to the planning bases.

The reason for this revision is to align the Plan with the recently developed FY95 Annual Operating Plan and outyear funding as defined by the Department of Energy. It is anticipated that this Plan will be revised and issued again as Revision 5 after the FY97 Five Year Plan is finalized in April or May of 1995.

A complete listing of acronyms appears in Appendix O. A High Level Waste System flowsheet is also attached as Appendix P. Reference to this flowsheet will enable the reader to better understand the text of the Plan.

State of the HLW System

The FY95 funding reduction and the projected FY96 funding reduction have resulted in a net reduction of about $287 million during the FY95 - FY00 planning period. While some of the reduction is planned to be offset by implementation of an aggressive manpower reduction program, the overall operation of the HLW System will be negatively impacted as follows:

- the startup of the Replacement High Level Waste Evaporator project has been delayed by a projected 42 months from 11/97 to about 5/01;
- most elements of scope in the Waste Removal Program have been delayed from 12 to 48 months;
- planned HLW System attainment has been reduced from 36% to 26% for the first 8.67 years of System operation;
- the overall HLW System attainment decreased from 45% to 43 % thus extending the duration of the HLW Program by two years; and
- a general "belt tightening" has occurred in all areas of the HLW System that leave the program with no contingency to handle emergent requirements.

The projected DWPF startup date remains 12/95. It is projected that the Tank Farm will be able to support that startup date and subsequent operation albeit at a significantly lower attainment than in previous revisions of this Plan. This Plan does describe a viable, though not efficient, strategy for the operation of the HLW System based on the reduced funding profile.

The 2F Evaporator was restarted 3/25/94 after completion of Conduct of Operations improvements and conversion to High Heat Waste service. Through the end of 9/95, 351,000 gallons of tank space has been recovered by 2F Evaporator operations versus a goal of 350,000 gallons. The 2H Evaporator was restarted on 4/19/94. This evaporator recovered 864,000 gallons of space through the end of September versus a goal of 521,000 gallons. Evaporator operations finished the fiscal year 34% ahead of goal.

ITP startup testing has been completed. The Readiness Self Assessment and the Westinghouse Operational Readiness Review have been completed. Completion of emergent modifications required for startup has driven the projected startup date to 3/1/95; a nine week change from Revision 3 of this Plan. The later startup date plus the increased cost of the readiness reviews have combined to reduce the previously planned three production batches in FY95 to one batch.

The ESP Process Verification Test continues, albeit at a reduced rate, in parallel with planning for slurry pump elevation changes, top and bottom seal repairs and other minor repairs. The engineering evaluation of seal leakage and development of alternate seal options and remediation plans continues. Processing and consolidation of the first batch of sludge is scheduled to be complete 12/95; an eight month delay from Revision 3.

Design and construction of the RHLWE continued on schedule in FY94. Erection of building steel is complete and the crane has been installed. The projected startup date is currently being evaluated in light of the reduced funding for FY95-97. It is estimated that startup will be delayed by 42 months, from 11/97 to 5/01. The 5/01 date is used in this Plan.

The Waste Removal Program is not projected to receive the funding that was used to rebaseline the program earlier this year. Some of the scope can be delayed due to the RHLWE delay, thus reducing the impact of reduced funding however, the sludge batch #2 tanks (Tanks 8, 11 and 15) are projected to be delayed by 3 years. The tanks in sludge batches #2 & 3 are now projected to meet the FFA Waste Removal commitment dates "just in time". Further perturbations, such as additional funding reductions or emergent project needs or compliance program needs, could mean renegotiation of these dates.

DWPF has completed melter heatup and has poured twelve canisters of simulated waste glass. The ammonia scrubber and hydrogen mitigation modifications outage is currently in progress and progressing ahead of schedule. The schedule for radioactive startup remains 12/95.

The design and construction of the Late Wash bypass lines is complete and the Auxiliary Pump Pit modifications remain on schedule. The project cost has been rebaselined and is within the $41.5 million Total Estimated Cost with adequate contingency as originally estimated. The startup date has been rebaselined to 6/96.

Additional progress has been made in the area of System Integration and planning:

- an Addendum has been attached to this Plan to show the regulatory and financial impacts of operating the HLW System at different attainments as compared to the Revision 4 base case;
- a draft of the System Integration Management Plan has been issued that describes how planning is accomplished, the resources required, and the roles and responsibilities of each HLW organization;
- the Process Interface Document has been issued as Revision 0;
- the first phase of the Integrated Flowsheet Model is now operational;
- the first ten cycles of the ITP operation have been planned through FY03;
- Systems Engineering principles continue to be developed and implemented to improve HLW planning with functions defined down to the facility level (these functions are being used to compile, sort and prioritize technology needs); and
- the HLW Technology Program Plan for FY95 has been issued.

System Planning Improvement Oppurtunities

There are several areas that will be developed to enable more efficient allocation of funding, improve balance between the various HLW System components, improve process modeling, improve baseline schedules, improve waste forecasting, reduce cost and therefore increase overall System attainment.

Improved planning and integration of the HLW System will remain a high priority. The full implementation of the first phase of the Integrated Flowsheet Model, development and issuance of the System Integration Management Plan and procedure, as well as establishment of a group to own and operate the Integrated Flowsheet Model are planned to be completed in FY95.

While there is a strong basis for the Integrated HLW Schedule (Appendix F), the following areas need further planning and schedule development:

- resource loading;
- planning for emergent compliance-related activities such as Waste Certification, DOE Orders and DNFSB recommendations;
- ITP production planning;
- the Diversion Box & Pump Pit Containment project;
- Tanks 21, 22 and 24 for dilute waste storage;
- Tank 41 return to salt service;
- return to salt service for salt removal tanks after Tank 41;
- cooling coil replacement for Tanks 29-31;
- F-Area to H-Area Interarea Line support system upgrade;
- DWPF mercury runs recycle handling; and
- the RHLWE and Waste Removal programs both require resequencing and Baseline Change Control actions due to the budget reductions.

1.0 Introduction

This Plan describes the strategy for the integrated startup and operation of the High Level Waste (HLW) System based on the most efficient allocation of available and projected resources. This Plan is revised each time that there is a major perturbation in the planning basis. This revision documents the results of the FY95 Annual Operating Plan (AOP) planning process and the projected $55 million budget reduction in FY96. One of the goals of this planning process is to continuously improve the Plan to better serve the needs of the Department of Energy (DOE). Revision 4 of this Plan incorporates several improvements since Revision 3:

- the tabular listing of the Tank Farm Material Balance in Appendix J.4 showing influents, effluents, and available tank space has been extended from five years to the end of the program in the year 2020;
- additional key milestones have been added and are described in more detail in Section 6.4;
- a new section, Section 8.3 "HLW System Material Balance" has been added to more thoroughly discuss this important indicator of the ability of the HLW System to achieve its Mission; and
- an Addendum to this Plan is attached that describes the regulatory and financial impacts of operating the HLW System at different attainments as compared to the base case to which this Plan is developed

The planning basis for this revision is not quite as strong as the basis for Revision 3. While some programs such as In-Tank Precipitation (ITP) and the Defense Waste Processing Facility (DWPF) have made significant progress and thus reduced uncertainties, others have increased uncertainties as follows:

- inability to allocate full funding to the Replacement High Level Waste Evaporator (RHLWE) in FY95-97 has removed the driver for some of the FY95 Waste Removal Program scope that supported the RHLWE;
- the currently projected funding for the Waste Removal Program in FY95-00 is not consistent with the funding used to develop the scope and schedule of the Waste Removal projects; and
- there has not been adequate time to accurately modify the baselines of the Waste Removal and RHLWE projects to match currently projected funding (the scopes and schedules used in this Plan are the best engineering estimates possible at this time).

The above is not to say that the basis for Revision 4 is weak, only that it is not quite as strong as Revision 3. Typically, HLW System Plans written after the Five Year Plan (i.e., Revisions 1 and 3) have a stronger basis due to the seven years of funding that have written scope versus one year in the AOP.

2.0 Mission Statement

The mission for the High Level Waste System is to:

- safely and acceptably store existing DOE high level waste;
- support critical Site production and cleanup missions by providing tank space to receive waste;
- volume reduce, and therefore stabilize, stored high level waste by evaporation;
- pretreat high level waste for further processing and disposition;
- dispose of high level waste in interim and permanent facilities; and
- ensure that risks to the environment and to human health and safety posed by high level waste operations are either eliminated or reduced to prescribed, acceptable levels.

This will be done using the most technically effective and cost efficient means reasonably achievable while providing appropriate opportunities for public involvement.

3.0 Purpose

The purpose of this HLW System Plan is to document the baseline for the currently planned HLW operations from the receipt of fresh waste through the operation of the DWPF and Saltstone. This document is a summary of the key planning bases, assumptions, limitations, strategy and schedules for facility operations as supported by the FY95 AOP and the projected outyear funding guidance provided by DOE for FY96 through FY00 in lieu of the FY96 Five Year Plan (FYP). This Plan will also be used as a base document for developing the FY97 FYP and for adjusting individual project baselines to match projected funding.

4.0 High Level Waste System Description

This Plan refers to the HLW System; key facilities of which are listed below. Detailed descriptions of the individual facilities are provided in Appendix A. The HLW System includes Tank Farm operations from receipt of fresh waste to the processing and transfer facilities required to deliver feed to and receive recycle from the DWPF, the DWPF operation, and the key supporting operations such as Saltstone and the Consolidated Incinerator Facility as shown below:

High Level Waste
- F-Area Tank Farm
- 2F Evaporator
- H-Area Tank Farm
- 1H Evaporator
- 2H Evaporator
- Replacement High Level Waste Evaporator project

- New Waste Transfer Facility project
- Waste Removal Program
- Diversion Box & Pump Pit Containment project
- In-Tank Precipitation
- Extended Sludge Processing
- F/H Effluent Treatment Facility
- F/H Interarea Line
- planned future projects

Defense Waste
- Defense Waste Processing Facility
- Late Wash
- Saltstone
- Saltstone Vaults
- planned future projects

Solid Waste
- Consolidated Incinerator Facility

5.0 Planning Constraints

Operation of the HLW System facilities is subject to a variety of programmatic, regulatory and process constraints as summarized below.

5.1 Oversight Constraints

5.1.1 HLW System Plan Administration

Some uncertainty is inherent in this Plan. Lack of actual operating experience in the new processes, as well as emergent budget issues, changes to Canyon production plans, evolution of Site Decontamination & Decommissioning (D&D) initiatives, and other factors hinder "absolute" planning. Therefore, Department of Energy Headquarters (DOE-HQ), Department of Energy Savannah River (DOE-SR) and Westinghouse Savannah River Company (WSRC) personnel are continuously evaluating the uncertainties in the Plan and prioritizing changes that can improve planning and scheduling confidence. WSRC refines and updates the current Plan and Integrated Schedule after each significant perturbation to the planning basis.

The **HLW Steering Committee** provides the highest level of oversight of the HLW System. This Committee is formally chartered and consists of members from DOE-HQ, DOE-SR, the WSRC HLW Department and the WSRC HLW System Integration Manager. The committee meets approximately every 6 weeks for a formal review of the status and plan for the HLW System. The HLW System Plan is approved by DOE-HQ, DOE-SR, and WSRC HLW.

The **WSRC HLW Management (HLWM) Division Program Board** provides oversight and approval of the HLW System Plan and the schedules contained therein which form the schedule and cost "baseline" for the overall program. Maintenance of this "baseline," especially with regard to technology developments and alignment with the AOP, is controlled through a formal change control process. Board approval is required before line programs take action which could have a significant impact on the Integrated Schedule. The Board is also responsible for ensuring that actions to meet program objectives are accomplished through the responsible line management. The Program Board is chaired by the HLWM Division Vice President & General Manager, and is comprised of the HLWM Division's key Level 2 line program and support department managers.

5.1.2 HLW System Integration Management Plan (SIMP)

The High Level Waste system is comprised of six inter-dependent processing facilities, each of which is subject to a myriad of processing constraints and requirements as it acts upon complex waste streams. Effective production planning for such a complicated system requires the use of sophisticated planning and modeling tools and the cooperation and interaction of many organizations throughout the division. The HLW SIMP describes the production planning methodology applied in the HLWM Division, including the roles and responsibilities of particular organizations, the planning, modeling, and evaluation tools used, administrative controls applied to the process, and the resulting production planning document.

Three of the key elements described in the SIMP, the Process Interface Document (PID), the HLW Integrated Flowsheet Model (IFM), and the Technical Oversight Steering Team (TOST), are explained below.

5.1.3 HLW Process Interface Document

The PID has been issued as Revision 0. The PID presents a summary description of each HLW facility, specifically describes the interfaces between those facilities and discusses the control of the interfaces. Each interface is administratively controlled by an Interface Control Document.

Once the PID is implemented, changes to technical baselines for facilities within the HLW System will be reviewed to determine if they could impact the interfaces described in the PID before the changes are implemented within the individual facilities. Thus, the PID will be a tool for ensuring that changes to facilities within the HLW System are consistent with the overall HLW Mission.

5.1.4 HLW Integrated Flowsheet Model

The HLW IFM is a dynamic computer simulation of the HLW System, which will enable HLW management to predict how the HLW System will operate, given the constraints described in the HLW System Plan and the PID. Each HLW facility process will be modeled and key chemical constituents will be tracked using Speedup(R) software. This will facilitate improved short and long-term decision analysis and strategic planning.

The IFM will be evaluated to possibly replace the steady-state flowsheet (the Chemical Process Evaluation System or CPES) that has been used for planning in the past. Development of Phase 1 of the model is complete. All of the individual facility models are operational but are not fully calibrated or de-bugged. Phase 1 of the HLW Integrated Flowsheet Model will be operational in early FY95. Future upgrades are planned in FY95 to incorporate additional chemical and radioactive constituents, energy balances and other process details. The IFM will also eventually be used to develop an approved IFM Flowsheet Document which will serve as the production plan for the HLW System.

5.1.5 Technical Oversight Steering Team

The TOST provides the necessary oversight for all technical issues within the HLW System. Each major program (Tank Farms, Waste Removal, ITP/ESP, and DWPF) has similar technical oversight committees that identify, define, track and resolve emergent technical issues. The TOST organizes these committees to eliminate duplication of effort, identify common issues, focus management attention where needed, improve response time, set priorities and provide general oversight as required to effectively manage issue resolution. Over 400 issues have been identified and recorded in a database. Each issue has been assigned to an appropriate manager for resolution. Twenty-two common issues have been identified. The TOST will also approve the IFM Flowsheet Document described above.

5.1.6 Public Participation

New and ongoing programs in the public participation arena are described below as they apply to the Site in general and the HLW System in particular.

Citizens Advisory Board (CAB): The Savannah River Site (SRS) has formed a Citizens Advisory Board to advise the Site on environmental cleanup and waste management issues. The Board is comprised of 25 culturally and geographically diverse community representatives including: five public officials, three business representatives, three academic representatives, five general public representatives (including two politically or economically disadvantaged persons), two labor representatives, two minority issues representatives, and five environmental/activist representatives. The CAB has been formally chartered and has begun meeting on a regular basis. SRS has been providing information to the CAB members on current Site missions, activities and issues as well as responding to questions and requests for additional information or tours. Input from the CAB will become part of the Site's decision-making process regarding current and future Site activities.

Public Participation in NEPA Activities: The National Environmental Policy Act (NEPA) requires federal agencies to assess the potential environmental effects of constructing and operating new facilities or modifying existing facilities, and to obtain public input prior to making decisions on such facilities. DOE has used innovative approaches to obtain the public's input on the DWPF Supplemental Environmental Impact Statement (SEIS), the Waste Management EIS and the Integrated Nuclear Materials Management (INMM) EIS. In addition to the scoping meetings and public hearings mandated by NEPA, DOE also held four information meetings for the three EISs geared toward educating the public on the facilities being addressed. Notices for the meetings have been run in numerous newspaper, radio and television ads and meeting times and locations have been expanded to best accommodate the public. Comments may be made by writing or attending the public hearings or by telephone. For additional information on current NEPA activities, refer to Section 5.2, below.

5.2 Regulatory Constraints

5.2.1 Safety Documentation

Facility operations are conducted within the defined boundaries of the appropriate Safety Analysis Report (SAR) or other appropriate safety documentation such as Operational Safety Requirements, Process Requirements, Technical Standards, Process Hazards Reviews, etc. The highest level safety document for each facility is listed with current status and pertinent comments in Appendix B.1.

5.2.2 Environmental Permits and Regulatory Agreements

The primary environmental permits for each facility are listed in Appendix B.2 with current status and comments. A discussion of the major regulatory agreements and associated issues follows.

Land Disposal Restriction - Federal Facility Compliance Agreement (LDR-FFCA): This agreement, made between DOE and the Environmental Protection Agency (EPA) Region IV, provides a period of time for DOE to implement specific commitments made regarding the generation, storage and treatment of prohibited mixed wastes at the Savannah River Site until the Site Treatment Plan becomes effective. The recent "Bridging Amendment" contains the following commitment for DWPF:

"Perform DWPF testing, startup and waste processing activities to meet the requirements and schedules of the Waste Removal Plan and Schedule established under the Federal Facility Agreement."

This commitment currently appears as an Appendix B (Tier 2) commitment, which is legally binding but does not carry any fines or penalties for violations. In the future, regulators could opt to make this an Appendix A (Tier 1) commitment, which carries fines of up to $8,000 per day for violations.

Federal Facility Agreement (FFA): The FFA was executed by DOE, EPA and the South Carolina Department of Health and Environmental Control (SCDHEC) and became effective on August 16, 1993. The FFA provides standards for secondary containment, requirements for responding to leaks and provisions for the removal from service of leaking or unsuitable HLW storage tanks. Tanks that do not meet the standards set by the FFA may be used for the continued storage of their current waste inventories, but these tanks are required to be placed on a schedule for removal from service. The "F/H Area High Level Waste Removal Plan and Schedule," submitted to Regulators on November 10, 1993, shows specific start and end dates for the removal from service of each non-compliant tank, and commits SRS to remove the last non-compliant tank from service no later than 2028. Conservative outyear funding projections formed the basis for this distant end-date. The Regulators have been advised that more optimistic funding forecasts may enable SRS to complete these commitments as early as 2020.

Subsequent submittals to SCDHEC have included the "F/H Area High Level Waste Tank Status Report" and the "HLW Tank Annual Assessment Report," (both submitted on March 16, 1994); and the "HLW Tank Annual Inspection Report," (submitted May 1994). Quarterly updates with the Regulators were held in February 1994 and July 1994.

It is the intent of SRS to negotiate a one year "rolling window" of commitments based on the current year AOP, update the commitments as each new AOP is developed and to commit to only those activities directly related to Tanks 1 through 24 within the one year window. However, SCDHEC has neither approved nor disapproved of the SRS approach as of September 1994.

Site Treatment Plan (STP): The Resource Conservation and Recovery Act (RCRA) requires the DOE to prepare plans describing the development of treatment capacities and technologies for each DOE site generating or storing mixed waste. The information contained in the plans will allow DOE, Regulatory Agencies, the States and other stakeholders to efficiently plan mixed waste treatment and disposal by considering waste volumes and treatment capacities on a national scale. A tiered approach to the development of the STP provides an opportunity for early involvement of all stakeholders regarding technical and equity issues. A Conceptual Site Treatment Plan, which includes SRS's current inventory of high level waste and the high level waste treatment system, has been prepared, and a Draft Site Treatment Plan, which explores on-site and off-site treatment options in more detail, was completed in August 1994.

The Draft Site Treatment Plan identifies DWPF as the "preferred treatment option" for treating the Savannah River Site's liquid high level waste, and includes the following commitments:

"Completion of non-radioactive test work and approval to commence radioactive operations is planned within the second quarter of FY96";

"Operations shall commence within 12 months after the successful introduction of radioactive test materials into DWPF. Commencing operations shall mean the initial transfer of high level waste to the DWPF vitrification building"; and

"Provide schedule for processing backlogged and currently generated mixed waste within 120 days after commencing operations".

Although fines and penalties for violations of these commitments have not yet been defined, WSRC expects that they will be similar to those imposed in the FFCA. The Final STP is scheduled for completion February 1995.

5.2.3 National Environmental Policy Act Activities

The National Environmental Policy Act requires federal agencies to assess the potential environmental impacts of constructing and operating new facilities or modifying existing facilities. DOE is currently preparing three NEPA documents that directly effect the High Level Waste System.

DWPF Supplemental Environmental Impact Statement: DOE is preparing a SEIS for the DWPF. The SEIS will supplement the Final Environmental Impact Statement (FEIS) that DOE issued in 1982 (DOE/EIS-0082), and will evaluate whether and how to proceed with the DWPF in light of the changes in processes and facilities that have occurred since the 1982 FEIS was issued. Process modifications to be evaluated in the SEIS include ITP, Saltstone Processing and Disposal, Late Wash, Nitric Acid Introduction, Hydrogen Modifications, Ammonia Mitigation Modifications, the Organic Waste Storage Tank, Failed Equipment Storage Vaults, Glass Waste Storage Building #2, and alternatives to benzene treatment.

The "No Action Alternative" is to continue waste storage and evaporation, with operation of the Effluent Treatment Facility (ETF) and Saltstone only. The "Proposed Action" is to continue construction of the DWPF as currently designed, continue process and facility modifications, complete startup testing activities and operate the DWPF and the HLW System as currently planned. "Alternative Actions" include examining other reasonable system alternatives to the DWPF, such as mitigation measures, pollution prevention efforts, and facility design modifications that could reduce the risk of operating DWPF.

Development of the SEIS is working toward a Record of Decision (ROD) by 12/94 in order to support ITP startup. An ROD for any action other than the Proposed Action could significantly delay the startup and operation of the ITP and DWPF facilities.

Waste Management Environmental Impact Statement (WM EIS): DOE is preparing an EIS for the Site's Waste Management facilities. The WM EIS will address the operation of the F-Area and H-Area Tank Farms, the existing evaporators, the Replacement High Level Waste Evaporator, Waste Removal, the New Waste Transfer Facility and the Effluent Treatment Facility. The WM EIS will also be coordinated with the development of the Site Treatment Plan, and will address low-level radioactive waste, high-level liquid radioactive waste, hazardous waste, mixed waste, and transuranic waste.

The "No Action Alternative" consists of continuing waste generation and waste management practices as they are today, and include completing construction of, but not operating, the Consolidated Incinerator Facility (CIF). The RHLWE can be operated under the "No Action Alternative" as this operation is virtually the same as the existing evaporators. The "Proposed Action" encompasses the "No Action Alternative" scope plus programmatic and project-level actions to enhance waste management operations over the next ten years, comply with regulatory requirements, protect human health and the environment, and support SRS missions. The "Proposed Action" also calls for considering various combinations of pollution prevention, waste minimization, treatment, storage and disposal technologies, and identification of a preferred strategy for each waste type. A "Minimum Treatment, Storage, Disposal (TSD) Alternative" would provide a lower bound on future waste volumes and waste management activities, and assumes that some waste would be shipped offsite. A "Maximum TSD Alternative" will provide an upper bound on future waste volumes and waste management activities, and assumes that some waste may be received from offsite sources as a result of the Federal Facilities Compliance Act, the Environmental Restoration/Waste Management (ER/WM) Programmatic EIS, and the Reconfiguration Programmatic EIS. Development of the EIS is working toward a Record of Decision by 6/95.

Interim Nuclear Materials Management Environmental Impact Statement: DOE is preparing an Environmental Impact Statement for the evaluation and disposition of useful nuclear materials, given the evolving requirements for the nation's defense programs and the need to safely manage nuclear materials until disposition decisions can be finalized (in approximately five years). This EIS will determine which nuclear materials can continue to be safely stored as they are, and which materials require near-term stabilization to help maintain the health and safety of the workers and the public and to maintain environmental quality. A number of disposition options are being evaluated, some of which could impact the HLWM Division. For example, some nuclear materials solutions could be transferred directly to the Tank Farms. While this option creates a very small influent volume of waste, many potential nuclear safety concerns would have to be resolved for the entire HLW System before such a transfer would be feasible. On the other hand, diluting and poisoning the nuclear materials solutions similar to standard waste transfers would eliminate the nuclear safety concerns, but would create such a large volume of waste that the Tanks Farms would be unable at present to accommodate this volume. HLWM Division personnel are providing input to these and other scenarios being evaluated in the EIS. Preferred options for dispositioning of the nuclear materials will be provided in the Record of Decision, which is expected in 3/95.

F Canyon Plutonium Solutions Environmental Impact Statement: After publishing the Notice of Intent to prepare the INMM EIS, DOE determined that the current condition of plutonium solutions stored in F-Canyon warranted consideration of stabilization in advance of the decisions to be made for the IMNM EIS. Therefore, a separate EIS is now being prepared to address this situation. As in the INMM EIS described above, possible disposition alternatives include direct disposal of the plutonium solutions to the Tank Farms with subsequent processing through the HLW System. A Record of Decision is expected 1/95.

For additional information on related NEPA activities, refer to Section 5.1, Oversight Constraints, Public Participation Activities.

5.2.4 DOE Orders and 90-2

There are two programs in place on site to address compliance with DOE Orders and industry codes and standards.

DOE Order Compliance: The DOE Order Compliance Program assesses each facility's status of compliance with applicable DOE Orders. Administrative compliance is measured by the adequacy of programs and procedures ("evidence documents") which implement DOE Order requirements. Field compliance is measured by the extent to which facility personnel execute those programs and procedures. The results of the assessments are recorded. Non-compliances are corrected or exemptions are requested.

Order compliance assessments have been completed at DWPF and ITP in accordance with the WSRC 8B Manual, "DOE Directives Administration." A division-wide configuration management program is being put in place to maintain the accuracy of the references cited in the administrative assessments. Field compliance assessment results for DWPF and ITP will be verified during each facility's Readiness Self Assessment (RSA) prior to the Operational Readiness Review (ORR). The DOE Order requirements will be aligned with the RSA requirements through the WSRC SCD-4 Manual, "Operational Readiness Functional Area Requirements" card program. These cards will become the basis for a continuing self-assessment at each of the facilities.

90-2 Standards/Requirements Identification Document (S/RID) Program: The 90-2 Program, named for Defense Nuclear Facility Safety Board Recommendation (DNFSB) 90-2, expands upon the DOE Order Compliance Program by addressing those applicable national consensus codes and standards which are related to Environmental, Safety & Health concerns.

Appropriate requirements are identified for each facility, and recorded in a S/RID, which is organized around the 22 functional areas to be assessed. S/RIDs have been developed for all applicable functional areas of DWPF. The original S/RIDs have been revised to achieve consistency, remove redundant requirements, and provide updated interface references. The revised S/RIDs were submitted to DOE as an Award Fee Milestone on July 27, 1994.

Administrative compliance assessments are being conducted for those S/RID requirements not already covered by the DOE Order Compliance program, and will eventually be added to the SCD-4 cards for continuing self-assessment. Non-compliances, if any, will be evaluated and prioritized for disposition prior to startup, although implementation of some requirements may be deferred until after facility startup.

5.3 Operating Constraints

5.3.1 Waste Removal Sequencing Considerations

The following generalized priorities have been used to determine the current sequencing of waste removal from the HLW tanks:

1) Maintain adequate emergency tank space per the Tank Farm SAR;
2) Control tank chemistry including radionuclide and fissile material inventory;
3) Ensure blending of processed waste to meet the ITP, Saltstone and DWPF feed criteria;
4) Enable continued operation of the evaporators;
5) Remove waste from tanks with a history of leakage;
6) Remove waste from tanks which do not meet secondary containment and leak detection requirements;
7) Provide precipitate feed to DWPF starting 6/96;
8) Maintain an acceptable precipitate balance in Tank 49;
9) Support the startup and continued operation of the RHLWE;
10) Maintain continuity of radioactive waste feed to the DWPF; and
11) Remove waste from the remaining tanks.

While the principal driver for the HLW System Plan is the removal of waste from the old-style tanks, it is necessary to remove salt waste from some of the Type III Tanks to support the cleanup of the older tanks. Removal of salt waste from new tanks is required to maintain the evaporator systems on-line and to provide space as required to receive the large transfers involved with the waste removal processes and DWPF recycle. For the current period, removal of salt from Type III Tanks 41, 25, 28, 29, 38, 31, and 47 must receive priority to support the key volume reduction mission of the 2H and 2F Evaporator systems. Relative to planning, it is the complex interdependency of the HLW and DWPF safety and process requirements that drives the actual sequencing of waste removal from tanks.

5.3.2 Process Considerations

Waste Removal from Type I, II and IV Tanks: HLW at SRS is stored in carbon steel tanks. Some of these tanks do not provide adequate secondary containment and leak detection capabilities. In the case of the Type IV Tanks, no secondary containment is provided. Several of the HLW tanks have leaked in the past. While no tanks have active leak sites and a formal monitoring program exists, the risk to the environment will be reduced by removing the waste from the storage tanks. Liquid waste will be removed from the HLW storage tanks and processed through the DWPF into a solid borosilicate glass waste form contained in stainless steel canisters. ITP, ESP, Late Wash, DWPF and Saltstone are all new operations necessary to accomplish the mission of processing the waste into glass.

DWPF: DWPF is the cornerstone of the waste removal program and a one-of-a-kind facility. It is currently expediting startup testing to support radioactive operation beginning 12/95. Subsequently, this drives HLW operations as necessary to supply both the initial and continuous feed to DWPF per the startup schedule.

Tank Space Availability: Ensuring the availability of sufficient operating space in specific tanks at specific need dates is a key consideration in the development of an operating strategy. Process strategy, in addition to providing safe storage of waste and a feed stream to DWPF, must also generate additional tank space to serve as surge capacity. This recovered tank space results from waste removal through ITP or by processing of existing dilute HLW supernate through the evaporator systems. This space gain is extremely important for the following reasons:

- to maintain the evaporator systems on-line;
- to provide space to receive the large waste volume transfers which are a by-product of ESP, Waste Removal and DWPF operations; and
- to ensure flexibility to handle unanticipated problems that could require additional tank space.

6.0 Planning Bases

6.1 Reference Date

The reference date of this Plan is September 30, 1994. Schedules, budget, manpower, milestones, cost estimates, and operational planning were current as of that date.

6.2 Funding

The funding required to support the HLW System Plan through FY00 is shown in Appendix M by individual Activity Data Sheet (ADS). The funding is based on the following:

- FY95 AOP funding in the amount of $538 million;
- additional FY95 3161 funding in the amount of $13 million to train personnel from other WSRC divisions that can be used to fill vacancies in the HLW Division;
- FY95 pension reduction of $13 million such that this funding can be used to fund HLW projects and programs;
- FY95 encumbrance reduction of $11.5 million such that this amount can be applied to the RHLWE Total Estimated Cost (TEC);
- projected FY96 HLW funding in the amount of $494 million per DOE guidance;
- projected FY97 - FY00 funding escalated at 3% per year from FY96,;
- FY95-96 manpower reductions in startup programs at NWTF, DWPF, Late Wash and ITP; and
- a 4% manpower reduction in the base operating programs in FY96, 4% in FY97, 2% in FY98 and 0% reduction thereafter.

Evaluations were in progress at the time of this Plan regarding the amount of the 3161 funding that can be used in FY95. The concern is that jobs may not be available in FY96 based on the new funding guidance ($494 million versus $551 million in FY96) for each displaced worker that has been retrained in FY95 using 3161 funding.

The total funding available to the HLW System is greatly reduced from the funding shown in the FY96 FYP. The total reduction over the five year planning period is almost $287 million dollars, as shown below:

HLW System	95	96	97	98	99	00
FY96 FYP Baseline	581.4	551.7	562.4	573.4	584.6	596.1
FY95 AOP & projected	538.4	494.2	509.0	524.2	540.0	556.2
Delta	-43.0	-57.5	-53.4	-49.2	-44.6	-39.9
Cumulative Delta		-100.5	-153.9	-203.1	-247.7	-287.6

The available funding is allocated to the various HLW programs as shown in Appendix M. The bulk of the reduction is absorbed in three areas: the RHLWE, Waste Removal and manpower. Quick reference funding tables for the RHLWE and Waste Removal are shown below. Manpower is discussed in Section 6.3.

The funding in thousands of dollars for the RHLWE in FY95 and projected for the years FY96-00 is shown below. This funding profile will result in the previously planned radioactive startup date of 11/97 being delayed by about 42 months to 5/01. The term "about" is used because there has not been time to adequately rebaseline this program. The delay will result in a TEC increase due to escalation.

RHLWE	95	96	97	98	99	00
FY96 FYP Baseline	25,860	21,392	17,656	4,010	0	0
FY95 AOP & projected	3,904	4,000	4,000	13,039	15,962	15,840
FY95 Encumbrance Adj.	11,500					
Delta	-10,456	-17,392	-13,656	+9,029	+15,962	+15,840
Cumulative Delta		-27,848	-41,504	-32,475	-16,513	-673

The projected funding for the Waste Removal Program is less than the funding used to rebaseline this project in mid-1994 and is therefore less than the funding required to achieve the schedules shown in the project baseline. The shortfall (in thousands of dollars) is shown below. Note that the shortfall is understated by about $5 million due to a planned carryover from FY94 to FY95 that did not occur.

Waste Removal	95	96	97	98	99	00
WRP Baseline	40,800	52,400	57,100	57,500	46,300	43,500
FY95 AOP & projected	33,460	25,953	30,155	37,285	37,573	46,942
Delta	-7,340	-26,447	-26,945	-20,215	-8,727	+3,442
Cumulative Delta		-33,787	-60,732	-80,947	-89,674	-86,232

The funding levels used to develop this Plan are, however, slightly more than the funding levels used to develop the FFA Waste Removal Plan & Schedule. The key waste removal dates shown in this Plan are equivalent to their counterparts in the FFA however, the schedule float has been reduced from 3 years to about 1 year for the first eight tanks. Additional funding cuts similar to those experienced during the FY95 AOP development will result in the need to renegotiate the FFA Waste Removal Plan and Schedule.

6.3 Manpower

Projected HLWM Division manpower levels for FY95-00 are shown in Appendix K and include operations, maintenance, program management, engineering and Quality Assurance staffing. Support group manpower is not shown, however, it is available in the FY95 AOP and FY96 FYP. The values are in Full Time

Equivalents (FTEs) which is the weighted average manpower level during the year (e.g., if the year is started with 0 and 1 person is hired per month, then the average manpower for the year (i.e., FTEs) would be 6.5). The manpower is listed by Activity Data Sheet (ADS).

FY95 is planned to be the peak manpower year for the HLW System. This is due to the ITP startup, the establishment of an operator "pipeline" to ensure that a minimum number of qualified operators are available when needed, and the final preparations for the FY96 startups of DWPF, New Waste Transfer Facility (NWTF) and Late Wash. Manpower will be reduced in ITP and DWPF after those facilities are started up. In addition, there will be a further 4% manpower reduction in base programs in FY96, a 4% reduction in FY97 and a 2% reduction in FY98. This is an aggressive program to reduce manpower to enable more of the available funding to be used for DWPF feed preparation.

The planned reductions are best illustrated by looking at the H-Tank Farm (ADS 32-AA) in Appendix K. This ADS takes on the operation of the NWTF, Waste Removal activities and a new control room yet reduces manpower from FY95 to FY98. At this time, a plan does not exist to implement the manpower cuts described above. Several initiatives are in progress to identify cost savings and evaluate potential areas of manpower reductions. Oversight is provided by a joint WSRC/DOE Cost Reduction Task Team.

The only programs that grow are Waste Removal, the RHLWE project, Saltstone and HLW New Facility Planning. Waste Removal will require additional FTEs to perform the waste removal operations. Saltstone plans to add a second shift in FY97 to support ITP production. Several engineers are required to support planned Line Item projects in the New Facility Planning ADS. The need for the second shift for Saltstone is currently under review.

6.4 Key Milestones and Integrated Schedule

The key milestones relate to the processes required to safely remove radioactive waste from storage and process it into canisters of glass or into Saltstone. For HLW operations, these milestones relate to Waste Removal, ITP, ESP, evaporation and the associated transfer operations. For the DWPF, the key milestones relate to successful cold chemical testing, initiation of radioactive feed and successful operation of the Late Wash process. For Solid Waste, the key milestones relate to the Consolidated Incinerator Facility.

The key milestones shown below are supported by the budget as described in Section 6.2 and Appendix M. New key milestones have been added to this revision as many of the original key milestones have been accomplished. A complete listing of HLW milestones is shown in Appendix H. This listing is focused on FY95 milestones that are derived from the FY95 AOP. Only the most significant outyear milestones are listed.

Key Milestone	rev. 2	rev. 3	rev. 4
• Start ESP Process Verification Test	7/93a		
• Restart 1H Evaporator	12/93a		
• Restart 2F Evaporator	3/94	3/94a	
• Restart 2H Evaporator	4/94	4/94a	
• Complete Late Wash Bypass	7/94	7/94	7/94a
• Start up In-Tank Precipitation	12/94	12/94	3/95
• Start up New Waste Transfer Facility	10/95	11/95	11/95
• DWPF Radioactive Operations	12/95	12/95	12/95
• Start up Consolidated Incinerator Facility	1/96	2/96	2/96
• Tank 25 ready for salt removal (2nd ITP)	10/96	10/96	~6/96
• Start up Late Wash	12/95	3/96	6/96
• Precipitate ready to feed Late Wash	2/96	2/96	8/96
• Tank 28 ready for salt removal (3rd ITP)	5/00	6/99	~8/97
• Tank 29 ready for salt removal (4th ITP)	3/96	6/96	~9/98
• Tank 38 ready for salt removal (5th ITP)	12/97	8/98	~5/00
• H-Area control room consolidation		7/98	~7/00
• Tank 8 ready for sludge removal (batch#2)	12/98	12/98	~2/01
• Start up RHLWE	11/97	11/97	~5/01
• Tank 31 ready for salt removal (6th ITP)	6/97	5/97	~5/01
• Tank 15 ready for sludge removal (batch#2)	6/98	6/98	~7/02
• Tank 11 ready for sludge removal (batch#2)	6/99	6/99	~11/02
• Sludge batch#2 ready to feed	11/01	11/01	~11/04
• Sludge batch#3 ready to feed	7/05	7/05	~7/08

a = actual
~ = on or about the date shown

A detailed discussion of each startup, restart or operations milestone is provided in summary fashion in Section 8.2 and in detail in Sections 8.4 through 8.12. The Integrated Schedules are shown in Appendix F.

6.5 Long Range Planning and Site Infrastructure

The SRS has always been a DP landlord site. DP therefore paid for the operation and maintenance of common Site infrastructure via the GE-03 account. Starting 1/1/95, SRS will become an EM Site. This change is not expected to have an impact to the HLW mission.

In this Plan, it is assumed that the Site will continue to provide the necessary infrastructure to support the HLW Mission through completion of that mission, such as:

- maintenance of roads and bridges;
- services such as electrical power, steam, well and drinking water;
- analytical capability;
- pilot and semi-works facilities;

- design and construction services;
- spare parts and stores;
- environmental, quality assurance and safety support; and
- sanitary, hazardous, mixed and radioactive waste storage and disposal

The Site Long Range Planning function is integrated into HLW planning in two ways: 1) the Site Long Range Planning Manager is a standing member of the HLW Steering Committee, and 2) the HLW Integration Manager is a member of the Site Long Range Planning Committee.

The waste generation rates used in the Plan were provided by the Nuclear Materials Processing Division equivalent of the HLW System Integration Manager expressly for the development of this Plan. This is documented as NMP-PLS-94-0380 issued September 20, 1994. The F-Canyon must complete an EIS prior to restart which is currently projected to be 3/95. F-Canyon will operate through 7/99 at which time it will have completed its de-inventory and stabilization mission. The H-Canyon is planned to restart 10/95 and operate until its de-inventory and stabilization mission is complete in 1/02. The waste generated is shown in Appendix J.4. For a historical perspective, HLW generation is shown from Site startup in 1954 to the present in Appendix I, "Summary of Waste Receipts".

There are other streams that may be sent to the Tank Farm which are being proposed or evaluated such as unevaporated 211-F waste water after the Canyons are shut down and the contents of various vessels in the Canyons that are not included in the Plan described above. These streams are listed as issues in Appendix G.

Significant shifts of Site overhead and responsibility for Site infrastructure were estimated and incorporated into outyear plans and therefore in this Plan. Future revisions of this Plan will incorporate Site overhead and infrastructure planning as it is developed.

7.0 Key Issues and Assumptions

Key issues effecting the HLW System are listed below. Programmatic Issues relate to cost and schedule but require no new technology development. Technical Issues are those issues that require some form of technical resolution or technology development and may or may not have schedule and funding impacts. Each issue is tied to an assumption and potential contingency actions. A complete list of issues is shown in Appendix G.

7.1 Key Programmatic Issues

Programmatic issues are those where corrective actions have been identified, but there may be insufficient time, manpower or funding to implement the corrective actions. Key Programmatic Issues are shown below. Additional programmatic issues and uncertainties are described in Appendix G.1.

- **Waste Removal FFA Plan and Schedule**

  Issue: The once conservative funding assumptions used to build the FFA Waste Removal Plan and Schedule are no longer conservative. The tanks in sludge batches #2 & 3 are now projected to meet the FFA dates "just in time". Further perturbations, such as emergent project needs and compliance program needs, to the planning bases could mean renegotiating these dates. Additional funding reductions similar to those experienced during the development of the FY95 AOP will definately result in the need to renegotiate. It is not known how receptive the Regulator will be to any changes.

  Assumption: The current schedules and funding profiles shown in this Plan can be supported and achieved.

  Contingency: Obtain additional funding, achieve cost reductions elsewhere, or renegotiate.

- **Funding for the HLW System**

  Issue: Optimistic outyear funding expectations for the HLW System used in past Five Year Plans have historically eroded such that actual funding available for the AOP following the FYP is significantly less than expected. Over $800 million of projected funding has been removed from the HLW Program in the last two years. Current funding levels for the HLW System do not include any contingency for emergent work, although emergent work items are sure to occur. Emergent work takes the form of hardware, documentation and implementing new programs.

  Assumption: Funds for emergent work items or new scope will be made available by cost reduction initiatives, deferring other currently funded scope thus slowing down the HLW Program, or by reprogramming funds made available via cost savings initiatives.

  Contingency: WSRC HLWM Division personnel will maintain close communication with DOE-SR regarding budget status, emergent work issues, and availability of funds from cost savings initiatives.

- **Lack of Contingency**

Issue: This Plan, parts of the FFA Waste Removal Plan and Schedule, and most of the planned facility startups have no funding or schedule contingency. Commercial nuclear and chemical industry history is quite clear on the need for contingency in all planning activities; particularly in the "first of a kind" type of facilities described in this Plan. An argument could be made that a plan with no contingency is pre-destined for cost overruns and schedule delays.

Assumption: Funds for emergent work items or new scope will be made available by cost reduction initiatives.

Contingency: If the assumption above proves to be incorrect, then contingency actions could include: slowing down the HLW Program by deferring other work, not supporting Canyon programs or obtaining additional funding from other programs.

- **F/H Inter-Area Line**

Issue: All of the waste in F-Area must eventually be transferred to H-Area for pretreatment and disposal. Also, some of the dilute waste in H-Area must be transferred to F-Area to balance the evaporator load. The F/H Inter-Area Line (IAL) is currently not operable. It is required to be operational by 3/97 to support the transfer of dissolved salt solution from Tank 25 to ITP. The scope, schedule and estimate to restart operation of the F/H IAL is not known. Funding has been allocated in FY95 but not manpower.

Assumption: Manpower can be assigned and the required scope can be accomplished by 3/97 without significantly impacting other important activities.

Contingency: Accept a slowdown of the HLW Program in order to fund and staff restart of the F/H IAL.

- **Age of HLW Facilities**

Issue: Many HLW facilities constructed from the early 1950's to the late 1970's are continuing to show signs of age. The Tanks 1-8 transfer line encasement in F-Area has failed in one place and is leaking in several others. Groundwater leaking into Tank 19 was detected in FY94. Routine repairs to a steam regulator for the 2F Evaporator escalated into three weeks of downtime due to the poor condition of the service piping and obsolete instrumentation. The aging problem is compounded by reduced budgets and extending the duration of the HLW

Program. Aging facilities may cause excessive unplanned downtime, addition of unplanned scope to existing projects or the need for new Line Item projects to ensure that the Tank Farm infrastructure will be able to support the HLW Program.

Assumption: The H-Area encasement will not fail, the H-Area Type IV Tanks will not leak or fail, there can be sufficient funding allocated to plant life extension of the Tank Farms, and planned Line Item projects in FY96, 97 and 98 will remain on schedule to help refurbish and preserve the Tank Farm infrastructure.

Contingency: Accept a slowdown of the HLW Program and increased life cycle costs due to the degraded condition of the Tank Farm infrastructure, slow down the HLW Program to reallocate funding to support infrastructure, or obtain additional funding.

- **Life Cycle Cost of Operating the HLW System**

Issue: Hundreds of millions of dollars of projected funding have been removed from the HLW Program in the last two years. In order to balance near term funding reductions, the duration of the HLW Program has been extended. The funding required to keep the HLW facilities operational for the additional years amounts to billions of dollars in increased Life Cycle Costs.

Assumption: The assumption is that nothing can be done in the near term to improve this situation and that government agencies and the public will accept the increased Life Cycle Costs.

Contingency: An Addendum to this Plan describes alternative funding cases (two at higher funding levels than this Plan and two that are lower) and the impacts of the alternate funding cases. Additional funding and cost reduction initiatives can significantly improve Life Cycle Costs.

- **Emerging Compliance Programs**

Issue: There has been a steady stream of additional requirements and order compliance programs that the operating divisions are required to support and implement. Most of these are difficult to forecast because they are continually emerging with minimal involvement of all stakeholders and have very short implementation commitments. Examples are Waste Certification, DNFSB 90-2 and the Price-Anderson Amendment Act. This is compounded by the lack of contingency in funding, manpower and schedules for other important activities.

Assumption: The future emerging requirements will be maintained at current levels. Existing manpower will be used to implement existing requirements. Some requirements, such as DNFSB 90-2, will not be required to be implemented immediately in Tank Farm facilities.

Contingency: Obtain additional funding, achieve cost reductions or delay the HLW Program.

- **Plans to Avoid Saltbound Condition in Tank Farm Evaporators**

Issue: The 2F Evaporator has seven salt receipt tanks, six of which are full. The 2H Evaporator has two salt receipt tanks with about one third of one tank of space remaining. The RHLWE will have one salt receipt tank when it starts up. The 2H Evaporator system is of greatest concern because of the small amount of salt space remaining and because the 2H Evaporator is needed to evaporate the future DWPF recycle stream. Also, it is difficult to measure the actual volume of saltcake in a tank due to the way the salt forms. The only planned method to remove salt depends on the startup of ITP which is experiencing emerging work and other delays.

Assumption: Tank 38, in the 2H Evaporator system, does not contain more than the estimated amount of salt. ITP will start up 3/1/95, process one batch in FY95, three batches in FY96 and nine batches in FY97. Emerging requirements at ITP will not effect other important programs.

Contingency: Slow down the HLW Program so that resources can be used to respond to emerging ITP requirements, achieve cost reductions, slow down planned Canyon programs or delay startup of the DWPF until the Tank Farm is in a better position to support it.

- **Environmental Impact Statements**

Issue: The DWPF SEIS, the Waste Management EIS, the Interim Nuclear Materials Management EIS and the Plutonium Solutions Disposition EIS as discussed in Section 5 could have significant impact on the startup schedules for ITP, Late Wash, and DWPF as well as the decision to select the existing technology or process for each step in the HLW System. All of these EISs are on very tight schedules for development, approval and publication of the Record of Decision. Startups could be delayed if the EISs are delayed, or if the Records of Decision include paths forward which are different from what is currently assumed in the HLW Mission. An ROD of "No Action" could result in an indefinite delay in the execution of the HLW Mission while alternative actions are being developed; therefore leading to an increase in life cycle cost to complete the HLW Mission.

Assumption: Records of Decision will support current HLW System plans, and will be published in a timely manner; startup and operations schedules will not be adversely impacted.

Contingency: The contingency is to accept the ROD of "No Action", regroup and develop a new plan. This would be a complete change to the HLW System Plan.

- **Analytical Laboratory Capacity**

Issue: The startup of ITP, ESP, Waste Removal, DWPF and Late Wash will significantly increase the analytical burden on the Site laboratories. The attainment of each facility in the HLW System is dependent upon the timely turnaround of sample results. Analytical results are required to confirm that each processing step has been satisfactorily completed before proceeding to the next step. Future analytical needs for the HLW System may exceed the laboratory capabilities.

Assumption: Minimum analytical needs can be identified and appropriately scheduled and accommodated by onsite facilities such that HLW System attainment will not be adversely impacted.

Contingency: Alternative analytical methods which can decrease turnaround time are being evaluated as substitutions for previously planned, longer turnaround methods. Also, the Analytical Support and Methodology TOST Team is comparing projected analytical needs against current Site capabilities, and will facilitate changes in sample schedules or recommend improvements in Site resources as appropriate.

7.2 Key Technical Issues

Technical issues are primarily emergent issues that were identified during startup testing. The bulk of the known technical uncertainties relate to the operation of the DWPF and ITP processes. There are a few issues concerning the interaction between facilities such as the ability to meet the downstream facilities' feed specifications. Key technical issues are listed below. These issues are described in Appendix G.2.

- **Resolution of DWPF Technical Safety Issues**

Issue: Recent safety studies for the DWPF have postulated new accident scenarios which the current facility design does not adequately address. These accident scenarios will require upgrades of existing systems to higher safety classification. Facility modifications to achieve equivalent safety classification (to the degree appropriate for a backfit situation), along with additional administrative controls, are being pursued. Facility modifications have been proposed for the process vessel purge/inerting systems, the Zone 1 ventilation system and its supporting systems, the vitrification building effluent monitoring system, and select chemical storage tanks, to ensure that on-site and off-site personnel will be adequately protected from exposure to radiological and non-radiological materials in the event of a Design Basis Earthquake. However, the final cost of these modifications has not been confirmed, and the schedule to implement these changes could adversely impact the DWPF startup schedule.

Assumption: Adequate funding sources can be identified, the work can be completed without impacting the DWPF startup schedule, and the "equivalent safety class" modifications with compensatory actions are adequate as proposed.

Contingency: DWPF personnel have presented their plans to the DNFSB and DOE's Office of Nuclear Safety, with favorable responses from both groups. Design activities are proceeding in support of a 12/95 DWPF startup. If the proposed actions and compensatory actions are not acceptable, then the DWPF startup plan will be rebaselined and the delay to startup minimized to the extent possible.

- **Sludge Suspension in ESP Tank 42**

Issue: Preliminary data from the ESP Process Verification Test indicate that the existing pumps in Tank 42 may not be able to suspend all of the sludge in the tank. This can effect washing, aluminum dissolution, and the size of the batch. In the worst case, the size of sludge batch #1 could be what is currently in Tank 51 and all of the pumps in Tank 42 will have to be reworked or replaced with larger capacity pumps. If the sludge was not adequately suspended in the 1983 ESP demonstration, then additional aluminum dissolution could be required. A significant rework in Tank 42 is not scheduled or budgeted at this time.

Assumption: The plan to raise the pumps in Tank 42 and lower them incrementally to resuspend the sludge will enable washing of sludge batch #1 can be completed on schedule to support DWPF startup.

Contingency: Barring chemistry concerns, sludge batch #1 could be started with the current contents of Tank 51 while the Tank 42 slurry pumps are repaired/replaced. The contents of Tank 42 could then be washed and added to Tank 51. Other variations of this theme could also be viable. A task team has been formed to develop options and an action plan.

- **Tank Farm Geotechnical**

Issue: Geotechnical, structural and safety analyses for ITP were completed per the Seismic Issues Resolution Program Plan. The present FY95 scope would complete the resolution program for H-Area. Additional guidance from DOE may require additional work to be done to comply with emerging standards yet to be agreed upon. Current funding levels for the Seismic Issues Resolution Program do not cover some of this emerging work.

Assumption: Funds for emerging work or new scope will be made available by deferring other currently funded scope or by obtaining additional funding made from DOE.

Contingency: WSRC HLWM Division personnel will maintain close communication with DOE-SR regarding the scope of work to be done and the cost and schedule for completion.

- **Waste Certification**

Issue: Waste Certification has evolved into a much more complicated set of requirements than originally envisioned. The technical resources needed to qualify the first waste form (low level solid waste) exceeded all expectations. Several waste forms, such as slurry pumps or other large and difficult to decontaminate objects, may not meet the requirements for disposal without considerable decontamination or assay operations. Facilities and manpower to perform these new functions are not available and have not been forecasted. Other important activities have already been effected by Waste Certification.

Assumption: Waste Certification and other emergent requirements can be implemented with the currently forecasted resources.

Contingency: Funding and manpower for emerging requirements will be made available by deferring other currently funded scope, by achieving cost reductions in other areas, by slowing down the HLW Program or by obtaining additional funding.

8.0 Integrated Production Plan

8.1 General

The planning bases for the 2F and 2H Evaporators and DWPF are firm and progressing on schedule. ITP and ESP are both experiencing problems and the schedules have been changed accordingly. The NWTF schedule is slightly behind as personnel are supporting ITP. The NWTF schedule is recoverable. The Waste Removal Program continues to generate quality schedules with each new funding scenario. Other schedules are based on demand dates: Diversion Box & Pump Pit Containment, Tank 41 return to salt service, and F to H-Area Interarea Line upgrade. The latter schedules are being developed but they were not complete at the time of this Plan.

The Waste Removal and RHLWE schedules shown in this Plan contain some unknowns, primarily due to the projected near term funding shortfall from FY95-00.

8.2 Operational Plan Summary

This section is a brief summary of the remainder of Section 8. Additional detail is provided in Sections 8.3 through 8.12.

The 1H Evaporator was restarted 12/93 and operated until 3/94 when it was shut down due to a failed tube bundle. Delays in the F and H Canyon restarts result in a diminished need for the 1H Evaporator and it is therefore planned to leave this evaporator down.

The 2F Evaporator restarted 3/94. Space gain through 9/94 started slowly due to a variety of problems but finished strongly in September with the 2F Evaporator exceeding its FY94 space gain goal of 350,000 gallons by 1,000 gallons. 2F will continue to evaporate the backlog of F-Area High Heat Waste (HHW) as well as all F-Area fresh waste in FY95.

The 2H Evaporator restarted 4/94 and has operated at a rate well ahead of the planned space gain assumed in this Plan. The backlog of Receiving Basin for Offsite Fuel (RBOF) and Low Heat Waste (LHW) has been largely eliminated. 2H exceeded its FY94 space gain goal of 521,000 gallons by 343,000 gallons. 2H is planned to go down in 5/95 for a six month outage to replace the evaporator vessel which is nearing the end of its life expectancy.

ESP sludge batch#1 washing continues under the guidance of the ITP/ESP Startup Test Group per the Process Verification Test (PVT). The PVT serves the function of resuming the operation in a disciplined manner under the guidance of the Joint Test Group. Actual operating data is being collected to either validate the existing technical baseline or to improve it. Progress on the Tank 51 portion of the PVT has been limited by problems with the slurry pumps such as: excessive bottom seal leakage, leakage from the top seal or seal water piping, and interference between the rotating slurry pump and the stationary spray chamber. The PVT has been revised to accommodate inspections and repairs of the problem areas as well as lowering two slurry pumps to more thoroughly suspend the sludge in the bottom of the tank. The original PVT called for 2 washes in Tank 42 and 3 washes in Tank 51 which finished the washing required for sludge batch #1 by 9/94. Due to the slurry pump seal leakage problems, this finish date is now 9/95. If the final wash is required in Tank 51, then this will be complete by 12/95.

ITP is planned to start up 3/95. Tank 41 will be the first salt tank emptied via ITP although concentrated supernate from other tanks (i.e., Tanks 27, 28, 29, 32, and 38) will be blended with Tank 41 dissolved salt. Tank 41 is planned to be completely emptied over a period of 30 months versus partially emptying the tank and returning it to salt receipt service. The long duration for emptying Tank 41 is due to the many small batches at the start of the salt removal campaign, the need to allow insoluble solids to settle from the dissolved salt solution in Tank 40 prior to transfer to Tank 48, and the additional sampling requirements placed on Tank 41 due to the criticality concerns.

The first precipitate washing step will be conducted at the end of the fourth ITP production batch as opposed to at the end of the third batch (the average flowsheet production cycle is three batches followed by a wash) because that will be the earliest date where there will be enough precipitate to wash. The cesium and potassium content in Tank 41 is well below the flowsheet average thus very little precipitate is generated. The bulk of the precipitate is derived from the concentrated supernate that is blended with Tank 41. A sufficient inventory of salt precipitate is projected to be available to initiate and sustain feed to Late Wash by the end of the first cycle wash which is 6/96.

The NWTF schedule has been rebaselined and shows startup occurring 11/95. This supports the planned 12/95 DWPF startup but not the DWPF Mercury Runs. The recycle from the Mercury Runs will be processed in the ETF.

DWPF Cold Chemical Runs, Melter Heatup, and pouring the first 12 canisters of simulated waste glass are complete. The plant is currently in the Hydrogen/Ammonia Mitigation Modifications outage prior to starting Waste Qualification Runs. The outage is progressing on or ahead of schedule.

DWPF will start up with a radioactive spike test (FA18.01) and then transition to radioactive sludge operations under the guidance of the test program (FA20.01) during the first four months of operation. Late Wash startup is scheduled to occur 6/96 with ITP precipitate available 6/96 so the sludge-only campaign would have a duration of about three months.

Sludge batch #2 will be ready to feed 11/04 and will last until sludge batch #3 is ready 7/08. This is a 3 year delay from Revision 3 of this Plan. The attainment of DWPF during the period of batch#1 and #2 feed will average 26% and 39%, respectively. The overall operation of the HLW System has been extended by two years due to the reduced funding in the FY95 - FY00 time frame. This alone increases the Program cost by about $1 billion in FY95 dollars.

8.3 HLW System Material Balance

The Tank Farm Material Balance is the key planning tool used to develop this Plan. The balance between influents to the Tank Farm and effluents to DWPF and ETF is critical during the next five years due to the lack of space in the Tank Farm. The lack of tank space impacts the ability to receive influents from Separations and DWPF and to store salt concentrate from the Evaporators. A review of the forecasted influents and effluents and their impact on the HLW System is provided below. This is also listed iin tabular form n Appendix J.4 and shown graphically in Appendix J.3.

Working Inventory of Tank Space

Influents and effluents are listed only as they impact the Type III Tanks that are used to store and evaporate HLW, herein referred to as the "working inventory" of tank space. The old-style tanks are not considered part of the working inventory because the Tank Farm Wastewater Operating Permit does not allow fresh waste to be added to old-style tanks. ITP Tanks 48-50 and ESP Tanks 40, 42 and 51 are also not part of the active inventory because there is no plan to use these tanks for anything other than the pretreatment of HLW (the one exception is Tank 42 which is planned to be used for emergency spare service in between sludge batches #1 & 2). Also, each Tank Farm is required to maintain 1.3 million gallons of space in Type III Tanks as emergency spare. The "Working Inventory" column in Appendix J.4 is the total available tank space in the working inventory of Type III Tanks after deducting 2.6 million gallons for emergency spare space. The goal is to get a 3,000,000 gallon working inventory of available tank space before DWPF starts up 12/95.

Influents - F-Area LHW and HHW

The F-Area Canyon is currently shut down through the end of February 1995 as indicated by the low influent volumes in Appendix J.4. The F-Area Canyon restarts in March 1995 and operates through September 1997 processing the on-site inventory of "at risk" fuel elements. Influent volumes to the Tank Farm range from 40,000 to 42,000 gallons per month while the F-Area Canyon is operating. All suceeding volumes are shutdown flows.

H-Area LHW and HHW

The H-Area Canyon is currently shut down through the end of September 1995. The H-Area canyon restarts October 1995 and operates through the year 2002 processing the onsite inventory of "at risk" fuel elements. Influent volumes range from 45,000 to 55,000 gallons per month while the H-Area Canyon is operating. Suceeding volumes are shutdown flows.

DWPF Recycle

The DWPF recycle is based on the planned attainment for each of the six batches of sludge feed and the age of the DWPF plant. The recycle volume in gallons per minute can be calculated as follows:

$$gpm = 2.50 + (4.43)(attainment) + (0.16)(n)$$

where: attainment = fractional attainment
n = number of years after the start of radioactive operations with a range of 0 to 4

DWPF recycle ranges from a low during sludge batch #1 of 1,920,000 gallons per year to a high during sludge batch #3 of 3,000,000 gallons per year.

Tank Washwater

The waste tank interiors of all tanks that are to be removed from service are water washed as part of the waste removal program. The annulus of each tank with a leakage history is also water washed. The volume of the tank interior wash is planned to be 140,000 gallons which is a level of about 40 inches in most tanks. The annulus wash is assumed to be two 25,000 gallon washes which is a level of about 24 inches in the annulus for each wash.

ESP

The ESP washwater values are planned for the remainder of sludge batch #1 washing and based on a CPES model for each of the remaining five batches. Three of the four remaining decants out of ESP sludge batch #1 pre-treatment will be stored in Type IV Tanks for later use as salt dissolution water. The spent washwater from sludge batch #2 - 6 pre-treatment is planned to be evaporated. It is possible that this washwater will also be stored for salt dissolution instead of evaporation, however, the conservative assumption of evaporating this stream is used. The washwater for each batch is generated during the 30 month period immediately before the batch is fed to the DWPF. No differentiation is made in Appendix J.4 between the water used to slurry and transport the sludge to the ESP tanks, aluminum dissolution waste, and sludge washwater.

Other Influents

Influents from the 100-Areas were listed in previous revisions of this Plan but are now planned to be zero. There are no plans to support the Reactor Basin water quality programs using HLW tanks. Also, the ETF evaporator bottoms that are transferred to Tank 50 do not impact the Tank Farm inventory as Tank 50 is not used to store and evaporate HLW. The RBOF impact on the working inventory is projected to be zero because all of this waste will be stored in Tank 23 and used to dissolve salt in Tank 41 and subsequent salt tanks.

Effluents - 2F Evaporator

The 2F Evaporator is expected to gain 700,000 gallons of space in FY95. If the F-Area Canyon sends less waste than the forecast, then space gain will be less. Space gain after FY95 is based on the projected volume of the waste streams allocated to the 2F Evaporator as described in Section 8.6.3. In general, these streams are F-Area and H-Area HHW, F-Area LHW, sludge washwater from pre-washing F-Area sludge in F-Area prior to transfer to the ESP tanks, and tank washwater for the F-Area tanks. This evaporator is assumed to go down for 6 months in FY99 for a vessel replacement.

2H Evaporator

The 2H Evaporator is expected to gain 730,000 gallons of space in FY95. Space gain after FY95 is based on the projected volume of waste streams allocated to the 2H Evaporator as described in Section 8.6.2. In general, these streams are H-Area LHW and the first 1,800,000 gallons of DWPF recycle per year. This evaporator is assumed to go down for 6 months in starting May 1995 for a vessel replacement.

RHLWE

The RHLWE is planned to start up 5/01. Space gain is based on the projected volume of waste streams allocated to the RHLWE as described in Section 8.6.4. In general, these streams are DWPF recycle beyond the first 1,800,000 gallons per year, ESP washwater generated from H-Area sludge pre-treatment, and tank washwater generated from H-Area waste tank retirement.

In-Tank Precipitation

ITP space gain occurs when concentrated supernate is fed directly to ITP or when a salt tank is completely emptied and returned to salt receipt service. The space gained with each batch of dissolved salt removed from a salt tank is not shown because the plan is to empty the tank completely and not to reuse the tank until it is empty thus this space is not really available until the tank is completely empty and has been returned to salt service. ITP space gain is shown for the first ten cycles based on a 130 day cycle time when not limited by the precipitate level in Tank 49.

Other

The "Other" column lists waste transfers into and out of the Type III Tank working inventory as well as redeployment of waste tanks. ESP washwater is shown as an influent to the working inventory but may show as space gained in the "Other" column if the washwater is transferred out of the working inventory into Type IV Tanks. Redeploying Tank 42 from ESP use during the processing of sludge batch #1 to active storage use is also space gain. This tank is later deducted from the working inventory when it is redeployed to begin processing sludge batch #2.

There are several points to note from the "Working Inventory of Tank Space" chart in Appendix J.3. Tank space at the start of DWPF operations will be about 2.92 million gallons and is projected to remain between 2.9 and 6.2 million gallons for the first five years. Also evident in Appendix J.4 is that the net space gain due to evaporator operations alone is insufficient to offset the volume of influents. A significant amount of space gain occurs as a result of feeding ITP concentrated supernate or emptying a salt tank by feeding it to ITP.

8.4 In-Tank Precipitation

The startup date used in this Plan is 3/1/95. This date was 12/94 in Revisions 2 and 3 of this Plan. The FY95 AOP does not support the 3/95 startup date with three batches of production, hence only one batch is planned to be completed in FY95. The projected cost to complete the ITP SAR Addendum, Readiness Self Assessment and WSRC Operational Readiness Review has or will exceed the estimate in the FY95 AOP. The standard for these activities seems to be continually increasing, particularly after the recent F-Canyon experience where the WSRC ORR was successfully completed only to have the DOE ORR team conclude that the facility was not ready to start up. Most of the additional funding for these ITP activities will come from delaying ITP batches #2 & 3. It should be noted that the 12/94 date and cost estimate had no contingency or allowance for emergent work.

The startup of ITP is driven in the near term by the need to provide salt space in the evaporator systems to support the continued operation of DWPF. The evaporators will be needed to evaporate the DWPF recycle stream and future ESP washwater stream. The planning basis is for DWPF to start up 12/95 and then transition to sludge and precipitate feed within the first six months of operation. The Tank Farm will therefore need to be able to handle forecasted Canyon receipts, DWPF recycle and ESP washwater generated during the processing of sludge batch #2.

The best evaporator system to handle the DWPF recycle stream is the 2H Evaporator due to the piping configuration in the H-Area Tank Farm. The 2H Evaporator system has two salt receipt tanks: Tank 41 which is full of saltcake, and Tank 38 which is about two-thirds full of saltcake with most of the remaining tank space containing concentrated supernate that cannot be evaporated further. It is imperative to remove the salt from Tank 41 before Tank 38 fills with saltcake to enable the 2H Evaporator system to continue to operate and thus handle the DWPF recycle stream. The only viable plan to remove the salt from Tank 41 is to feed it to ITP. The 3/95 ITP startup date supports the planned 12/95 DWPF startup date with precipitate feed available 6/96 and Tank 41 empty and returned to salt service just as Tank 38 fills with salt.

In previous revisions of this Plan, the ITP flowsheet average was used as the basis for all planning that involved salt removal, salt processing, and salt precipitate feed to Late Wash. Production planning for ITP cycles #1 - 10 have now been developed. This is shown in Appendix J.1 for each batch and wash operation.

The first two ITP batches work off the waste heels in Tanks 48 and 49 that remain from the 1983 ITP Demonstration blended with some Tank 41 dissolved salt and some concentrated supernate from Tank 38. These are small volume batches increasing in size from about 400,000 gallons to the flowsheet average of about 800,000 gallons so that ITP can ensure adequate mixing in Tank 48. Some inhibited water is needed during the early batches to adjust the sodium molarity in Tank 48 as there is no ITP washwater available from Tank 22 to perform this function (the precipitate washing step has yet to occur). Unconcentrated supernate from Tank 32 is also consumed in Cycle #1. This waste is also used in lieu of recycled ITP washwater to adjust the Na molarity in Tank 48. The direct feed of concentrated and unconcentrated supernate to ITP is used to adjust chemistry, increase the Curie content, and to generate space in the evaporator systems.

The duration of Cycle #1 is planned to be 450 days (versus the normal cycle time of 130 days) with 92 days of downtime added due to using the funding for batch #2 & 3 chemicals to fund emergent work. The additional cycle time is an allowance for the initial startup of a one-of-a-kind facility and a planned technical evaluation at the end of each batch filtration. Likewise, the wash step is planned to require 90 days versus 40 days to accommodate the post-wash evaluation. The normal flowsheet is 3 batches at 30 days each plus one wash at 40 days for a total of 130 days per cycle. Due to the low cesium and potassium concentration in these first three cycles, additional batches are planned into each cycle before the wash step occurs. This has the effect of accelerating salt removal.

Precipitate is available at the end of the ITP cycle #1 wash in quantities sufficient to initiate and sustain feed to Late Wash. There is the ability to vary the feed to ITP to generate more precipitate earlier if required by feeding concentrated supernate from tanks that have higher cesium and potassium concentrations than Tank 41. This has the effect of delaying salt removal from Tank 41 as more frequent washes will be required. Salt removal from Tank 41 can be accelerated by feeding primarily Tank 41 dissolved salt and thus enabling more batches to be processed before a sufficient quantity of precipitate accumulates that must be washed.

Currently, the precipitate level in Tank 49 is administratively limited to 565,000 gallons assuming the design maximum radionuclide concentration of 39 Ci/gal. This liquid level in Tank 49 is based upon the rate of flammable gas generation in an unventilated tank and the assumption that three days may be required to re-establish tank ventilation after a seismic event. The 565,000 gallon precipitate level will be attained by 9/98. Revision 3 of this Plan assumed that the 565,000 gallon limit would be raised before this level was attained by completing hardware modifications. This Plan assumes that the 565,000 gallon limit remains in effect throughout the low attainment operation during sludge batches #1 & 2. The reason for this change is to reduce the residence time, source term, and therefore the absorbed radiation dose of precipitate stored in Tank 49. Laboratory testing has demonstrated that irradiated precipitate causes significant fouling problems in the DWPF offgas system when irradiated beyond 500 megarads of absorbed dose. After sludge batch #2, the feed rate to DWPF increases thus reducing the residence time for precipitate in Tank 49 and therefore the absorbed dose.

The chart in Appendix J.5 entitled "Tank 49 Precipitate Balance" shows the Tank 49 material balance and is based on the planned feed to ITP described in this section and in Appendix J.1 and the planned "ready for hot operations" date for Late Wash of 6/96. Points to note from the chart are as follows:

- the "sawtooth" shape of the curve shows the precipitate transfers from Tank 48 to Tank 49 at the end of each wash (nominally every 130 days) followed by the slow but steady drawdown of feed to Late Wash; and
- the Tank 49 inventory steadily increases until 9/98 when the ITP production rate must be slowed down to match the DWPF production rate.

It should be noted that the Tank 41 dissolved salt is projected to have a high concentration of chromium based on the limited samples taken to date. Chromium remains with the precipitate stream in the ITP process and is thus incorporated into glass. There may be sufficient chromium to exceed the glass limit. There are two sources of chromium in Tank 41 that are not common to other tanks: 1) the 2H Evaporator has evaporated the high chromium content RBOF waste with the concentrate dropping to Tank 41, and 2) the 241-49H Pumphouse chromate collection tank pumps out to Tank 43 which feeds the 2H Evaporator which also dropped concentrate into Tank 41. It is therefore possible that the anomolously high chromium analyses from Tank 41 salt actually reflect the chromium concentration in all or some of Tank 41. This issue will be investigated by reviewing essential materials records and transfer data from Tanks 21 and 23 into the 2H Evaporator system to develop a "chromium balance" around Tank 41. Also, It is possible that additional salt samples from deeper in Tank 41 will show the presence of chromium to be anomolously high in the top layer of salt which would resolve this issue. Another possible resolution is the dilution that takes place in Tank 49, i.e., the Tank 41 precipitate will be diluted by a much greater quantity of precipitate from the other tanks fed to ITP.

Another issue is the presence of insoluble solids in dissolved salt. Solids can be in the form of sludge, phosphate or sulfate. Tank 41 sample analyses indicate that sulfate in the dissolved salt will exceed the Tank 48 process requirement for insoluble solids. This can result in reduced filter performance. The sulfate can be removed from dissolved salt by gravity settling before transfer into Tank 48. Tank 40 now becomes crucial to the ITP process as it is the only viable tank to stage the Tank 41 dissolved salt in to allow the insoluble solids to settle before transferring to Tank 48.

8.5 Extended Sludge Processing

ESP started the Process Verification Test during 7/93 under the direction of the ITP/ESP Startup Test Group. A Test Plan is being used to govern the testing to gather data required to define long term operating parameters for the ESP facility. The data will be obtained during the course of two washes in Tank 42 and three washes in Tank 51. This is projected to be sufficient to prepare sludge batch #1 feed for DWPF based on previous sludge sample analysis.

The slurry pumps in Tank 51 have been started up and operated. The slurry pump seal leakage experienced in Tank 51 thus far has been greater than expected and other problems have been identified. PVT data indicate actual leakage on the order of gallons per minute versus the expected cc's per minute. A task team has been formed to address this problem as the PVT proceeds. Vendor and industry experts have participated in this effort. Initial recommendations have been implemented as follows:

- the leak in the bearing water piping at the top of the G riser pump has been repaired;
- the interference between the shielding ring and the spray chamber on the H riser pump has been repaired;
- the shaft on the B1 riser pump has been raised to compress the bottom seal faces in an attempt to reduce bottom seal leakage without removing the entire pump (the efficacy of this repair has not yet been tested, however, if it is not successful, then the B1 pump will be removed and one of the new pumps slated for Tank 40 will be installed); and
- The B4 pump has not had any problems thus far

Other recommendations from the slurry pump task team are long term in nature and will be evaluated for incorporation into the next generation of slurry pumps.

The Tank 42 pumps have been started and briefly operated. Initial data on seal leakage and vibration analysis has been within specifications. Inhibited water has been transferred into Tank 42 to initiate the next wash in that tank. It appears that two of the pumps on Tank 42 are not drawing amperage indicative of the work expected, i.e., pumping sludge. It is theorized that the pumps are submerged in sludge and are mixing only a small volume, raising the temperature of the "captive" sludge and cavitating. A test is planned to raise these two pumps into the liquid, operate them to check amperage, and then lower them in ten inch increments to resuspend the sludge. The other two pumps are operating well but the arrangement of the four pumps is not expected to fully suspend all of the sludge in Tank 42. This issue is important to the HLW System Plan and is therefore listed as a "Key Issue" in Section 7.2. A task team is investigating this issue and will develop an action plan for resolution.

The ESP PVT will generate about 1,400,000 gallons of washwater in four separate transfers. There is currently insufficient space in the 2H Evaporator System to accommodate the four large washwater decants out of ESP Tank 51. There is also no need to evaporate this washwater as it can be stored in Tanks 21 and 24 for later use as Tank 41 salt dissolution water. Three of the four decants will therefore be routed to Tanks 21 and 24.

Thus far, the PVT has generated excellent sludge suspension, sludge settling and temperature data. Sludge batch #1 washing is projected to be complete 11/95 with all sludge consolidated in Tank 51 one month later. DWPF will be ready to accept the first sludge transfer 3/96 per Test Plan FA20.01, Transition to Radioactive Operations.

The sludge in Tank 42 will be transferred to Tank 51 at the completion of washing batch #1. Tank 42 will then become the emergency spare tank volume in H-Area until it is required to start receiving sludge from Tanks 11 and 15 as part of sludge batch #2. This is shown in Appendixes J.3 and J.4.

8.6 Evaporators

There are two evaporators that are planned to be used to volume reduce the various waste streams coming into the Tank Farms in the near term: 2H and 2F. The operation of these two evaporators is crucial to the success of HLW and Site Missions. The Tank Farm currently has about 924,000 gallons of working inventory available in Type III Tanks excluding the ITP/ESP tanks and emergency spare requirements. The evaporators must volume reduce the remaining backlog of F-Area waste and keep current with new waste generated by Canyon operations and ESP. There is no plan to evaporate the 5,000,000 gallon backlog of unevaporated HHW in H-Area as the concentrate from this waste would consume the remaining salt receipt space if evaporated.

The goal for the evaporators is to have the Tank Farm in a position where the Tank Farm can be deemed "ready to support DWPF startup" by 12/95. This state of readiness can generally be described as:

- ITP started up and running well;
- salt removal projects proceeding on schedule;
- tank space available in each evaporator system to handle the DWPF recycle stream; and
- adequate tank space to support non-routine Tank Farm and DWPF operations with a high degree of confidence

A key planning assumption is the volume of the working inventory of tank space that is needed at the time of DWPF startup. The DWPF recycle stream is regarded in this Plan as a stream that cannot be "turned off" if there are evaporator problems. This is due to the negative effects of thermally cycling the DWPF melter. This drives the Tank Farm to recover a significant amount of tank space that will permit DWPF to continue operating if the Tank Farm has some serious upset condition, such as an evaporator pot failure or a technical problem that shuts down both evaporators for an extended period of time.

The Tank Farm goal is to have about 3,000,000 gallons of available tank space at the time DWPF starts up, not including tank space that must be held in reserve as emergency spare tank capacity should a waste tank fail. This value is proposed as the minimal contingency for unplanned events such as:

- prolonged evaporator outages;
- evaporator utility less than planned;
- space gain less than planned;
- additional evaporator pot failures beyond those expected;
- a tank leak;
- ITP operating at less than its planned rate;
- the Separations Canyons or DWPF generating waste above forecast;
- a Separations vessel failure resulting in contaminated cooling water that must go to the Tank Farm; and
- changing Site missions

Most of the events listed above have occurred in the past at SRS. The Tank Farm should always be in a condition where it can support these unplanned yet reasonable upset scenarios in addition to routine operations. Experience shows that total tank space in an evaporator system of less than 200,000 gallons is bordering on a "waterlog" condition. The evaporator system can be operated when waterlogged, however, it is very inefficient until more space is gained because of the following:

- the contents of the salt receipt tank must be frequently transferred back to the evaporator feed tank in small transfers;
- this frequency is about every 10 days when the tank space in the system is 200,000 gallons which does not allow the salt to completely cool in the salt receipt tank prior to transfer back to the evaporator feed tank; and
- the transfers back to the feed tank occur as the salt receipt tank is receiving salt concentrate from the evaporator

It could therefore be said that total tank space in the Type III Tanks must remain above 600,000 gallons (200,000 gallons for each of the three planned evaporator operations), assuming an optimal distribution of tank space, to avoid a waterlog or gridlock condition for the entire Tank Farm. The 3,000,000 gallons recommended is not overly conservative given the high volume and intermittent streams that must also be handled such as ESP decant water (this water is used to suspend and transfer the sludge from the sending tank to ESP), ESP aluminum dissolution waste and ESP washwater. The ESP washwater will routinely be about 400,000 gallons per wash while the other two ESP streams can be up to 900,000 gallons per batch. The DWPF shutdown flow is about 1,080,000 gallons per year. It is recommended in this Plan that at least one year of equivalent space be maintained to receive the DWPF recycle and maintain other operations assuming that no evaporators are operational. If 900,000 gallons of tank space is required to periodically receive waste from ESP, 1,080,000 gallons is required to support DWPF shutdown operations, and total tank space must not dip below 600,000 gallons to support evaporator operations, then total working inventory of tank space of 3,000,000 gallons at the time of DWPF startup is not overly conservative.

After DWPF starts up, the space gain from the 2F and 2H Evaporators and from ITP will be sufficient during the next five years to offset the waste generation until the RHLWE starts up in support of sludge batch #2 washing. It is important to achieve the 3,000,000 gallons of available tank space by 12/95 in anticipation of the higher waste receipts thereafter.

Evaporator space gain is defined as the difference between evaporator feed and evaporator concentrate corrected for flush water and chemical additions necessary to operate the evaporator system. In previous revisions of this Plan, the space gain for each evaporator was based on a factored historical average. In this revision, this planning basis has been refined to reflect FY94 actual operating data and planned future waste generation. This is discussed for each evaporator separately in the next four sections.

8.6.1 1H Evaporator

The 1H Evaporator vessel has a leaking tube bundle. This evaporator is planned to remain down until 1/1/98 when it must be removed from service as a condition of the Tank Farm Wastewater Operating Permit. At this time, the 2H and 2F Evaporators are projected to be able to support the HLW Mission until the RHLWE starts up 5/01.

FY95 activities include development and implementation of a decontamination plan to leave this system in a lay-up state suitable for future D&D. Milestones for this will be established by 10/30/94.

8.6.2 2H Evaporator

The primary role of the 2H Evaporator will be to evaporate the 221-H Canyon LHW stream and the future DWPF recycle stream to the extent possible.

The forecast for H-Area fresh LHW is about 11,000 gallons per month in FY95. After H-Canyon starts up in 10/95, this rate increases to about 32,000 gallons per month and remains there through FY02. All H-Area LHW is received directly into the 2H Evaporator system and evaporated.

The forecast for the RBOF stream in the Appendix J.4 Material Balance has been reduced to zero in this Revision of the Plan. This is because the approximately one million gallon backlog of RBOF waste in Tank 23 will be evaporated by 12/94. The forecasted RBOF receipts in Tank 23 of 360,000 gallons per year will be stored and used for Tank 41 salt dissolution and subsequent salt tanks. The impact of RBOF on the working inventory of tank space in Type III Tanks is therefore zero.

There will be four ESP washwater decants in FY95-96 as follows: 482,000 gallons, 350,000 gallons, 350,000 gallons and 225,000 gallons. The first decant will be evaporated and the last three decants will be transferred to Tank 21 or 24 for storage and later reuse as Tank 41 salt dissolution water. Starting with sludge batch #2, the ESP washwater will be evaporated in the RHLWE system.

A six month outage is planned to begin 5/95 to replace the aging 2H Evaporator vessel with a new vessel. The existing vessel is nearly ten years old which is about six months beyond the average life span. The goal is to have a new vessel in place before DWPF starts up. A failed vessel after DWPF startup would cause the available space goal of 3,000,000 gallons to be consumed at a rate of about 160,000 gallons per month unless DWPF were shut down. HLW has an internal goal of reducing the outage to four months but the six month outage is used in this Plan. The new vessel will have a Hastelloy tube bundle and warming coil that is expected to last for 30 years.

In the near term, it is crucial that the 2H Evaporator system gets into a position where it can support completion of ESP sludge batch #1 washing and DWPF recycle starting 12/95. This position is defined as follows:

- the aging 2H Evaporator vessel has been replaced;
- the evaporator has been restarted and is operating;
- ITP has started up and is running at a rate to complete Tank 41 salt removal before Tank 38 is filled with salt; and
- there is available salt receipt space in Tank 38 to last until Tank 41 is empty and returned to salt receipt service.

The planned 2H operation that would support DWPF startup 12/95 is based on a planned utility of 60% with a space gain of 104,167 gallons per month in FY95 and a six month outage for pot replacement.

It is important to note that the success of this evaporator system is dependent upon the transfer of concentrated waste from Tank 38 to ITP and on the transfer of dilute waste to the H-Area Type IV Tanks (Tank 21,22 or 24). The latter capability does not readily exist at this time, however it is planned to be attained in FY95.

After DWPF startup, the space gain for this evaporator is driven by the volume of H-LHW and DWPF recycle. The Appendix J.4 Material Balance Database uses an algorithm to forecast space gain after FY95. It is planned to evaporate all H-LHW in the 2H Evaporator. It is assumed that the volume reduction for this stream will be about 4:1 (0.71) based on historical and laboratory test data. In addition, the first 1,800,000 gallons per year (150,000 gallons per month) of DWPF recycle will be evaporated in the 2H Evaporator. It is assumed that the volume reduction for this stream will be 25:1 (0.96) based on the CPES Material

Balance waste composition. The algorithm in gallons per month is therefore:

2H Space Gain = (H-LHW)(0.71) + (DWPF Recycle @ 150,000)(0.96)

Based on the algorithm, the space gain for the 2H Evaporator increases to a high of 167,000 gallons per month or 2,000,000 gallons per year. The ability of this evaporator to attain this space gain is well documented in previous and recent FY94 experience, especially for dilute waste.

8.6.3 2F Evaporator

The 2F Evaporator was restarted 3/94. The initial operation was sporadic due to a thick layer of concentrated caustic liquor in the feed tank. Several actions were completed to resolve this problem and operations resumed 5/17/94. The evaporator achieved its monthly space gain goal in July but was brought down in August for a planned outage that became an extended outage due to failure of a 150 # steam regulator for which there was no ready replacement. Operations resumed in late August and, by the end of September, the 2F Evaporator had exceeded its FY94 space gain goal of 350,000 gallons by 1,000 gallons. 2F has demonstrated that it can achieve its planned space gain with normal feed.

The primary role of the 2F Evaporator will be to evaporate 221-F Canyon LHW, HHW and the remaining backlog of F-Area HHW in Tanks 33 and 34. Once this is complete, the 2F Evaporator's role will transition to becoming the primary HHW evaporator for F and H-Area HHW while keeping current with F-Canyon LHW waste receipts, washwater from pre-washing the F-Area sludge in F-Area prior to transferring the sludge to ESP (36% of all sludge resides in F-Area), the portion of DWPF recycle above 1,800,000 gallons per year (until the RHLWE starts up 5/01) and F-Area old-style tank washwater.

Prior to 12/95, it is crucial that the 2F Evaporator system gets into a position where it has worked off all available F-Area feed and can support the 2H Evaporator as needed after DWPF startup and during ESP sludge batch#2 washing. This position is defined as follows:

- the 2F Evaporator is operating; and
- there is available salt receipt space in Tanks 27 and 46 to last until Tank 25 is empty and returned to salt receipt service.

2F Evaporator utility is planned to be 60% with a space gain of 58,333 gallons per month during FY95. This is based on waste transfers made in late FY94 and availability of feed in FY95. These rates are below FY94 rates due to the low volume of fresh waste forecast and because evaporation of the backlog of F-HHW was nearly completed in FY94.

Starting in FY96, an algorithm is used to forecast space gain for the 2F Evaporator as shown in the Appendix J.4 Material Balance database. All fresh F-LHW, F-HHW and H-HHW is planned to be evaporated with a space gain factor of about 4:1 (0.71). This is based on historical experience as well as laboratory test data. Of the tank washwater shown in Appendix J.4, 44% is allocated to the 2F Evaporator as F-Area has 44% of the waste tanks. The space gain factor for this stream is conservatively estimated at 10:1 (0.90). ESP washwater will be generated in F-Area as sludge will be pre-washed in its home area before transfer to ESP. This waste stream is estimated to be the value in the "ESP" column of Appendix J.4 times 0.36 (36% of all sludge is in F-Area) times a space gain factor of 5:1 (0.80). This algorithm is therefore:

2F Space Gain = (F-LHW + F-HHW + H-HHW)(0.71) +
(0.36)(ESP washwater)(0.80) +
(0.44)(tank washwater)(0.90) +
(DWPF recycle - 150,000 gal/mo)(0.96)

The last term of the above algorithm dissappears after the RHLWE starts up 5/01 as this portion of the DWPF recycle stream is then allocated to the RHLWE.

8.6.4 Replacement High Level Waste Evaporator

The RHLWE is currently in the design and construction phase. The planned startup date in Revision 3 of this Plan was 11/17/97. This date will be delayed due to the shortfall of funding allocated to this project in FY95 - 97. The shortfall is shown below:

RHLWE	95	96	97	98	99	00
FY96 FYP Baseline	25,860	21,392	17,656	4,010	0	0
FY95 AOP & projected	3,904	4,000	4,000	13,039	15,962	15,840
FY95 Encumbrance Adj.	11,500					
Delta	-10,456	-17,392	-13,656	+9,029	+15,962	+15,840
Cumulative Delta		-27,848	-41,504	-32,475	-16,513	-673

The integrated construction/startup schedule was rebaselined in 9/94 based on the FY96 FYP funding profile. A schedule based on the reduced funding was not available at the time of this Plan. It was estimated by the TPC Manager that the delay would be between 42 and 48 months from the 11/97 startup date. A startup date of 5/01 (42 month delay) is used for planning purposes in this Plan.

The Total Estimated Cost (TEC) portion of the project progressed on schedule in FY94. Concrete emplacement, erection of building steel, and installation of the remotely operated crane is complete. The evaporator vessel has been received on site. Excavation and radiation surveys for future process line tie-ins and installation of the building skin was initiated. Fabrication and installation of piping continues. Activities for FY95 include installation of the vessel in the cell and completion of the building skin. FY95 Other Project Cost (OPC) activities will be minimal; primarily supporting design and construction and revising the project schedule.

The RHLWE is planned to operate at 80% utility and at a space gain based on the forecasted availability of feed. This space gain values shown in Appendix J.4 are well within the expected capacity of the RHLWE. The design basis is 7,600,000 gallons per year of overheads assuming feed at 33 gpm at 25-35% dissolved solids.

The plan for the RHLWE is to evaporate the balance of the DWPF recycle stream after the first 1,800,000 gallons per year, plus 64% of the ESP washwater (H-Area has about 64% of all sludge) plus the 56% of the washwater used to clean tanks that will not be returned to service (H-Area has 56% of the tanks). Space gain factors for these streams are the same as decribed in the previous section. The algorithm used to forecast RHLWE space gain in gallons per year is therefore:

$$\text{RHLWE Space Gain} = \begin{aligned}&(\text{DWPF recycle} - 1{,}800{,}000)(0.96) + \\ &(0.64)(\text{ESP washwater})(0.80) + \\ &(0.56)(\text{tank washwater})(.90)\end{aligned}$$

Revision 3 of this Plan discussed the need to have Tank 29 empty, the cooling coils replaced and the tank returned to salt receipt service before Tank 30 is filled with salt. This is now projected to occur two years after the 5/01 startup. Therefore, the driver to empty Tank 29 has been reduced and Tank 29 is no longer required to be the second tank fed to ITP.

A logic tie has been added to the Integrated HLW System Schedule in Appendix F that shows RHLWE radioactive startup as a predecessor activity to the start of processing sludge batch #2 in ESP. Aluminum dissolution and washing of sludge batch #2 generates about 4,100,000 gallons of wastewater over a period of two years. The existing 2F and 2H Evaporators cannot handle this waste in addition to the other influents (see Appendix J.4). The RHLWE is needed to gain space when this waste is generated. In the past, the RHLWE was planned to start up 11/97 which was well before sludge batch #2 processing. This is no longer the case, thus the new logic tie.

The justification for this project has been the subject of ongoing reviews and is therefore not a primary objective of this Plan, however, the two charts in Appendix J.3 and J.4 clearly show that the RHLWE (or some other form of space gain) is needed to support the long term operation of the HLW System, particularly at attainments above the 26% planned for sludge batch #1. Some of the required space gain could be achieved by treating the DWPF Slurry Mix Evaporator Condensate Tank (SMECT) waste, however, the WSRC recommendation is to complete and start up the RHLWE as soon as possible. There is less risk to the HLW Mission with the RHLWE operating as it can process any type of waste and it provides this type of capacity when 2F or 2H Evaporators are down. The SMECT evaporator is envisioned to treat only a specific, very dilute, low activity waste stream.

8.7 Waste Transfer Facilities

8.7.1 New Waste Transfer Facility

The radioactive operations startup date remains 11/29/95. This date supports the start of the DWPF Spike Test per Test Plan FA18.01. Leading up to the planned startup date, the following is planned to be successfully completed: startup testing, resolution of pump vibration issues, a Readiness Self Assessment, transfer line tie-ins, the WSRC ORR, the DOE ORR, remaining tie-ins, post tie-in verifications and finally, approval for radioactive startup.

In the past, the NWTF was planned to be used to transfer the DWPF mercury recycle stream to the Tank Farm. Ongoing development work by the Savannah River Technology Center (SRTC) and DWPF Engineering indicates that sending the mercury recycle to the ETF is technically feasible and operationally achievable with only minor modifications. This has the advantage of not burdening the Tank Farm evaporators with about 190,000 gallons of non-radioactive DWPF recycle. Another advantage is that DWPF could possibly continue testing beyond the planned 190,000 gallons with no impact to the Tank Farm. Transferring or trucking the mercury recycle waste to the Tank Farm or to a vendor supplied process will remain active contingencies to ETF.

Jumper changes in other diversion boxes connected to the NWTF continue to be planned at the time of this report. The jumper changes will cause localized outages in parts of the H-Tank Farm facility that could impact ITP, ESP and Evaporator operations. There is coordination between the various facilities intended to minimize or eliminate the impacts. This subject requires additional planning and coordination and is managed within HLW and reported in the weekly HLW Plan of the Week meetings. At this time, it appears that the impacts can be managed.

8.7.2 F/H Interarea Line

The F to H-Area Interarea Line (IAL) connects the F-Area and H-Area Tank Farms. A description of the IAL is provided in Appendix A. All F-Area waste must be transferred through the IAL to be processed in ITP or ESP. Some of the dilute waste streams and future H-Area HHW will be transferred from H-Area to the F-Area Tank Farm via the IAL. The maintenance and operation of the IAL is therefore critical to the HLW Mission.

At this time, the capability does not exist to transfer waste from H-Area to F-Area. Resuming H to F-Area transfers would require maintenance and repair of control equipment and instrumentation and some degree of post-maintenance testing. This work has not been completed because no need was forecast to transfer from H-Area to F-Area before the NWTF starts up (startup of the NWTF enables H-Area to F-Area transfers to be made using the NWTF equipment and controls). Transfers from H-Area to F-Area will be performed after the NWTF starts up in

11/95. These transfers will enable the 2F Evaporator to assist the 2H Evaporator with the DWPF recycle stream.

The capability to transfer from F-Area to H-Area also does not exist at this time. Process controls and F-Area Pump Tank-1 support facilities in must be upgraded. This upgrade is not part of any existing project. It is assumed to be a future Division Managed Modification. Scoping and engineering studies have been initiated, however, progress has been impeded by other higher priority programs such as manning the ITP outage and assisting with the Evaporator restarts.

FY95 funding in the amount of $600,000 is available to finish scoping this upgrade and to develop an action plan by 1/30/95. The remainder of the $600,000 will be used to initiate design and construction. The need date for this activity to be complete is based on the need to transfer Tank 25 dissolved salt to ITP. This is projected to occur in 1997. At the time of this Plan, manpower was not available to assign to this task. This is an open issue and is listed as such in Appendix G.1.

There was a Line Item project to upgrade the IAL. The scope of that project was to install a containment building and remotely operated crane on the high point vent valve box (a small diversion box-type structure mid-way between the F and H-Area Tank Farms). The justification for this project was based upon improved contamination control, particularly alpha contamination, during maintenance. This project did not involve replacing the IAL or any piping modifications. A FY93 Reprogramming action canceled this project and reallocated the funding to the DWPF Line Item for Late Wash. The basis for canceling the project was the infrequent need to perform maintenance in the high point vent valve box and the need to fund Late Wash.

8.8 Diversion Box & Pump Pit Containment

This project was originally scoped to install a ventilated building and remotely operated bridge crane over H-Area Diversion Box-7 (HDB-7). HDB-7 is the most utilized diversion box in the Tank Farm and is the hub for all transfers into ITP and ESP, all transfers from the H-Area Canyon to the H-Area Tank Farm, future DWPF recycle transfers, and all transfers associated with the 2H Evaporator System. The schedule used here is the project baseline schedule which shows construction activities complete 9/29/95. Three months are allowed for completion of OPC activities thus setting radioactive operations at 12/31/95. The OPC fragnet shown is based on a rough estimate rather than on a resource loaded OPC schedule. The OPC portion of the schedule is yet to be defined.

At the time of this Plan, soil quality and seismic concerns were driving the design activities on this project to evaluate alternate technologies to complete this project without extensive soil remediation. The schedule shown is therefore labeled as "under review" pending ongoing design reviews and option analysis.

8.9 Waste Removal

The cost, scope and schedule of the Waste Removal Program was recently rebaselined in early FY94 based on funding projections and assumptions provided by DOE-SR. Since that time, the total funding for HLW programs in the FY96 Five Year Planning period have been reduced by almost $287 million dollars. A significant portion of this reduction has been taken from the Waste Removal Program as shown below:

Waste Removal	95	96	97	98	99	00
WRP Baseline	40,800	52,400	57,100	57,500	46,300	43,500
FY95 AOP & projected	33,460	25,953	30,155	37,285	37,573	46,942
Delta	-7,340	-26,447	-26,945	-20,215	-8,727	+3,442
Cumulative Delta		-33,787	-60,732	-80,947	-89,674	-86,232

The reduction results in a nominal three year delay to the Waste Removal Program. Based on the best engineering estimates available at the time of this Plan, this funding reduction essentially removes the float in the schedule for the first six tanks in the FFA Waste Removal Plan and Schedule. The next several tanks have some float.

8.9.1 Salt Removal

The salt removal sequence has changed since Revision 3 of this Plan. Tank 25 is now the second tank, after Tank 41, in the queue to be fed to ITP and Tank 28 is third. This change was driven by the reduced funding for the RHLWE and Waste Removal Program.

The sequence listed below will support the ongoing operation of the 2F and 2H Evaporators and the 5/01 startup and continued operation of the RHLWE. However, it will enable only one tank to be available for salt removal most of the time thereby imposing further limits on the ability to blend salt feed to ITP. Concentrated supernate is available to blend with dissolved salt as needed. This strategy should ensure that adequate feeds for ITP are available if the waste characterization database is reasonably accurate. The risk is that the dissolved salt will differ from the predicted characterization and require blending to meet the ITP feed specifications.

Salt can be dissolved using inhibited water or dilute waste. The empirical ratio of water to saltcake is 2.4 : 1. This would be slightly higher with dilute waste was used as the diluent than inhibited water. Tank 41 would therefore require a minimum of 3,000,000 gallons of water to dissolve the salt. A portion of this water will be spent washwater from ESP sludge batch #1 pre-treatment and RBOF waste from Tank 23.

Tank 41 Salt Removal

Tank 41 will be the first salt tank fed to ITP. There are still outstanding criticality issues specific to Tank 41 due to the relatively high concentration of fissile U and Pu. The concern is that insoluble fissiles can concentrate in low spots in the salt formation inside Tank 41. Previous sampling and analytical studies indicate that the majority of U is soluble and that initiation of salt dissolution can safely proceed. There has been limited progress in this area since Revision 3 of this Plan. Ongoing evaluations indicate that the top three feet of saltcake can be safely dissolved without additional criticality safety controls.

As before, there is a strong need to feed Tank 41 to ITP as soon as possible in order to maintain the operation of the 2H Evaporator. While salt dissolution in Tank 41 can be safely initiated, it is still not known if all of the salt can be removed, the size of the batches or the rate of salt removal. Additional sampling and analyses are necessary to characterize the tank contents. The planning basis is that all of the salt will be removed from Tank 41 and fed to ITP prior to raising the pumps and preparing Tank 41 to return to salt receipt service. This will be accomplished through salt sampling followed by controlled dissolution batches based on sample results.

Salt removal from Tank 41 is scheduled to begin after ITP starts up. This is necessary to ensure that there will be an adequate supply of Tank 41 dissolved salt to feed to ITP in the second batch and the next several batches. The initial salt removal from Tank 41 will be slow due to the lack of working capacity in the tank and the sampling requirements. As salt is removed, larger and larger salt removal batches can occur. As stated in Section 8.4, Tank 40 must be available to stage the dissolved salt from Tank 41 to allow insoluble solids to settle prior to transferring to Tank 48.

There will be alternate feeds to ITP during and after processing of Tank 41, i.e., feeding existing concentrated supernate directly to ITP. A caustic rich liquor accumulates in evaporator systems that cannot be further evaporated. This concentrated supernate takes up space in the evaporator system that could be used to form saltcake. Currently, there are significant quantities of concentrated supernate in the 2F and 2H Systems. It has been determined that Tanks 26, 27, 29, 30, 38 and 43 can be fed to ITP without excessive dilution or criticality concerns. Alternate feeds must be very carefully planned as they contain from four to ten times the potassium concentration versus the ITP feed flowsheet average, thus they generate large quantities of precipitate which rapidly fill Tank 49.

Tank 25 Salt Removal

Tank 25 will be the second tank fed to ITP. Tank 25 must be empty and returned to salt service before Tanks 27 and 46 are filled with salt. Tank 25 will be ready for waste removal 6/96 with the first transfer of salt solution to ITP occurring 2/97. Tank 25 dissolved salt will be blended with Tank 41 dissolved salt and concentrated supernate from Tank 29 and supernate from Tank 32 to manage the Curie content of the feed to ITP. Slurry pump run-in and installation, and completion of construction punchlist activities comprise the bulk of the remaining Tank 25 TEC scope.

Because Tank 25 will be the first tank to undergo the waste removal graded startup process, it is referred to as the "Programmatic Waste Removal Tank". The startup approach used on Tank 25 will be the template for all succeeding tanks. Tank 25 will be the first F-Area tank to undergo waste removal. It will require completion of the F-Area common area support infrastructure as a predecessor to startup. These facilities include the motor control center, instrument control room, distributed control system, and bearing water makeup and distribution. Succeeding F-Area tanks will use this infrastructure. Tank 25 will also require the F/H IAL upgrade to be complete (see Section 8.7.2).

Tank 28 Salt Removal

This will be the third tank to be fed to ITP. Tank 28, like Tank 25, has most of the construction work complete. Work remaining includes slurry pump procurement, run-in, and installation, final electrical and bearing water connections, and seismic bracing of slurry pump platforms. Tank 28 must be empty and returned to salt service before Tank 25 fills with salt.

Tank 29 Salt Removal

Tank 29 will be the fourth tank to be fed to ITP. Now that the 1H Evaporator is planned to remain down, the RHLWE will start up dropping salt concentrate to Tank 30 instead of Tank 29. Tank 30 is projected to be filled by 11/03. Tank 29 must therefore have all of the salt removed, the cooling coils replaced (if needed) and the tank returned to salt receipt service by 11/03. The Tank 29 concentrated supernate and subsequent dissolved salt will increase the Curie content of precipitate to close to the 36 Ci/gal ITP limit. This is important because H-Area has very little LHW salt that can be used to blend with HHW salt. Processing straight Tank 41 salt solution to ITP effectively reduces the available stock of blending material for HHW salt. Tank 29 concentrated supernate will therefore be "metered" into the ITP feed stream to avoid inefficiencies in future operations.

Tank 38 Salt Removal

Tank 38 will be the fifth tank fed to ITP. It must be emptied before Tank 41 is refilled. Tank 41 is projected to fill very slowly over a period of about 10 years as the bulk of the 2H Evaporator feed will be DWPF recycle and fresh H-Area LHW. Design began in FY94 with the capital funding portion of Activity Data Sheet (ADS) 314-LI but was suspended in FY95 due to funding reductions.

Tank 31 Salt Removal

Tank 31 will be the sixth tank fed to ITP. Tank 31, like Tank 29, must also have the cooling coils replaced before it can return to salt receipt service thus increasing the demand to get this tank fed to ITP. There is no project scoped and budgeted for cooling coil replacement or return to salt service at this time. Evaluations are underway to more precisely determine cooling requirements for the RHLWE salt receipt tanks. At this time, it is assumed that Tanks 29-31 will require new cooling coils.

Tank 47 Salt Removal

Tank 47 will be the seventh tank fed to ITP. The driver for salt removal from this tank is to enable sludge removal to begin as part of sludge batch #3. The salt must be removed prior to sludge removal. Tank 47 contains the largest volume of sludge of any tank remaining after the batch # 1 & #2 tanks. This makes it a very economical source of sludge feed to DWPF. Due to budget constraints, it is very important to have this tank as part of batch #3 to help keep System attainment as high as possible. TEC work was scheduled to begin FY95 but has been deferred due to budget reductions.

Other Salt Tanks

The remaining salt tanks to be fed to ITP are shown in Appendix C.2. While almost all of the first sixteen sludge tanks emptied will be the old-style tanks, the same cannot be said of the salt tanks. The needs of the Tank Farm to handle normal waste receipts combined with sludge washwater and DWPF recycle dictate that those tanks that can be reused to store salt (i.e., the new-style tanks) must be emptied first. Of the old-style salt tanks, only Tanks 17, 19, 20 and 24 (all Type IV tanks emptied in the mid '80's) will be emptied of salt before the turn of the century.

8.9.2 Sludge Removal

Sludge removal is performed in a manner that yields six discreet batches (sometimes called "macro-batches" to distinguish them from the smaller batches used in ITP and DWPF) of sludge which will be individually segregated and characterized after pretreatment in ESP. Sludge batch #1 is currently in process in ESP Tanks 42 and 51. Sludge removal to support sludge batch #2 is several years away as the three tanks that will constitute sludge batch #2 are in the early stages of equipment design. The six batches are shown in Appendix J.2.

At the time of this Plan, the limiting factor for HLW System attainment was the ability to fund waste removal operations on the salt and sludge tanks. The System attainment for the duration of the waste processing campaign will average 43% with a high of 58% for sludge batch #3. Efforts are underway to evaluate the sludge batches to determine if a different sequence could be used to accelerate sludge batches #2 & 3 and thus increase attainment. The Regulator has been briefed that SRS may propose a different order of waste removal as a means of accelerating the program.

8.10 Defense Waste Processing

The DWPF startup schedule remains the same as in Revisions 2 and 3 of this Plan. DWPF achieved several important milestones since Revision 3. Construction continues on the Late Wash Pump Pit Modifications. Twelve canisters of simulated waste glass have been poured. The planned hydrogen/ammonia mitigation outage was started on time and was progressing on or ahead of schedule at the time of this Plan.

8.10.2 Vitrification

The startup schedule for DWPF remains unchanged from Revisions 2 & 3 of this Plan. WSRC plans to declare readiness to start radiological operations 11/95. The DOE ORR is scheduled to be complete by 12/95. Two weeks are scheduled to complete resolution of findings thus setting radioactive operations at 12/29/95. The plant will start radioactive operations per a Test Plan using simulated waste spiked with cesium. Performance of the Test Plan will be under the guidance of the Joint Test Group. A second Test Plan, "Transition to Radioactive Operations" will then be performed with radioactive sludge feed from Tank 51. After successful completion of the second Test Plan, the Joint Test Group will be disbanded. This schedule is shown in Appendix F. Note that there are two outages scheduled after radioactive startup for melter replacement. The life of a melter is estimated to be two years with five months for replacement and restart.

In the near term, the average attainment of DWPF, and therefore the HLW System, will be limited by the ability to provide the pretreated sludge feed. The consumption of sludge batch #1 feed will occur from 3/96 until 11/04 for an average attainment of 26%. This is not to say that DWPF could not operate at a higher attainment and then shut down when sludge batch #1 was completely consumed; only that the average attainment during sludge batch #1 will be 26%.

Attainment is defined as the design capacity times the design utility of the DWPF plant. The design capacity is calculated as follows:

$$\frac{228 \text{ lbs glass}}{\text{hr}} \times \frac{\text{can}}{3{,}705 \text{ lbs glass}} \times \frac{24 \text{ hr}}{\text{day}} \times \frac{365.25 \text{ day}}{\text{yr}} = 540 \frac{\text{cans}}{\text{yr}}$$

Therefore, 540 cans/yr is the design capacity, sometimes referred to as the instantaneous or nameplate capacity, of the DWPF. The DWPF design utility is 75%. Therefore, the maximum long term average attainment is (.75) (540 cans/yr) = 405 cans/yr. This value is referred to as 75% attainment. Thus, looking at sludge batch #3 in the table below, the maximum planned attainment of 58% remains well within the maximum design attainment of 75%.

In the long term, attainment will average 43%. The attainment for each sludge batch and for the entire campaign is shown on the next page.

batch	start	glass poured (cans/batch)	batch duration (years)	glass poured (cans/yr)	attainment as % of 540 cans/yr (%)
1	3/96	1,236	8.67	143	26
2	11/04	782	3.67	213	39
3	7/08	1,513	4.83	313	58
4	5/13	971	3.33	292	54
5	9/16	774	2.58	300	55
6	4/19	441	1.67	264	49
		5,717	24.75	245	43

In the near term, funding for the sludge batch #2 tanks is the limiting item at 26%. If this were corrected, then the DWPF laboratory turnaround time would limit attainment to 40-45%. An action plan is being developed to improve turnaround time. Significant long term attainment increases will also require expediting cold chemical procurement as well as all of the repetitive projects in the HLW System such as: Saltstone Vault construction, Vault capping, Vault permanent roofs, waste removal, Glass Waste Storage Building #2, and some Solid Waste projects that handle low level and mixed waste.

8.10.2 Late Wash Facility

A comprehensive review of the entire scope of this project was recently completed with the objective of driving the TEC from $66 million down to the original $41.5 million and to rebaseline the schedule. The TEC had been reduced to $41.5 million, however the OPC is projected to exceed the original budget of $17 million and is therefore the subject of ongoing reviews. At the time of Revision 3 of this Plan, the startup date was estimated to be 3/96 at the earliest. The schedule has since been fully developed and baselined to show a 6/96 planned startup.

8.10.3 Saltstone Facility

Though currently operating, the Saltstone facility will require construction of additional vaults, capping of filled vault cells and construction of permanent roofs. The required schedule for these repetitive projects is dependent upon the ITP production plan. As described in Section 8.4, this production planning process has been started and is providing information to assist in vault planning. The timing of Vaults #2 & 3 supports the planned near term ITP production plan. The timing of outyear vaults is based on the ITP flowsheet average. Saltstone operations and vault construction is shown in Appendix F.

Currently, construction of Vaults #1 & #4 is complete and both vaults are in service. Vault #1 has 6 cells, 2 of which are filled; and Vault #4 has 12 cells, 1 of which is filled. Vault #4 is the prototype for future vaults which will have 12 cells per vault. The Vault #1 operating plan is as follows: as each cell is filled, a 1 foot thick clean concrete isolation cap is installed and the Rolling Weather Protection Cover (RWPC) is moved to the next set of two cells. When all 6 cells are filled, the RWPC is dismantled and discarded. The future operating plan will be changed starting with Vault #2 as it will be designed with a permanent roof. Preparation of design and procurement specifications for a permanent roof for Vault #4 are currently underway although the availability of funding in FY95 is uncertain.

8.11 Consolidated Incinerator Facility

The CIF is currently scheduled to be complete in mid-1995, followed by a trial burn in November 1995. The FFCA commitment is for mixed waste operations to begin by February 2, 1996. The CIF will become an integral part of the HLW system at the time when the 150,000 gallon Organic Waste Storage Tank at DWPF becomes full. Due to the low attainment in the early years of DWPF operation, less cesium/potassium tetraphenylborate will be fed to DWPF, and therefore less benzene will be generated when compared to the long term flowsheet average. CIF is not expected to be required to support the HLW system until 1999, well after CIF's forecasted startup date. Therefore, CIF is treated in a summary fashion in this document.

There is a CIF concern that could impact the HLW System operation. The CIF is included in the Waste Management EIS in parallel with continuing construction of the facility. Publication of the WM EIS ROD is a prerequisite for the trial burn. There is a concern is that the ROD could delay CIF startup.

8.12 New Facility Planning

Planned FY96 - 00 new start projects pertinent to the HLW System are shown in Appendix N. These projects can be identified by fiscal year as well as the parent ADS designation (38-LI for HLW New Facility Planning projects and 25-LI for DWPF). The projects that are supported in the FY95 AOP and FY96 FYP have a fiscal year designation. Unfunded projects have a "TBD" designation in the "FY" column. Note that the two Benzene Abatement projects, which could be needed in FY98 or shortly thereafter, are not funded.

The Saltstone Vaults, DWPF Glass Waste Storage Building, Replacement Glass Melters, and Failed Equipment Storage Vault projects have been deferred consistent with a "just in time" philosophy. There is some program risk inherent in this approach particularly with the latter two projects as there is no actual operating data on the DWPF first-of-a-kind melters. The assumption of this risk was determined to be necessary to maintain the attainment of the HLW System as high as possible after DWPF startup. While this approach to balancing the projected funding generates significant funding for other programs, it also means that future attempts to accelerate the HLW System attainment must accelerate the entire series of each of these repetitive projects.

A small amount of funding is allocated to alternate technology development for new processes that may eventually replace existing processes. Two such technologies are described below.

SMECT Evaporator

The Slurry Mix Evaporator Condensate Tank (SMECT) is a vessel in DWPF that collects the condensed overheads from the Slurry Mix Evaporator. This stream is later combined with other waste streams in the Recycle Collection Tank for transfer back to the Tank Farm for evaporation. The SMECT portion of the recycle stream is about 43% of the total volume and should be very dilute. This stream is therefore a good candidate for some form of treatment that would keep it out of the Tank Farm. A total of $1,300,000 is available in FY95 to begin scoping a process and project that could treat this stream such that the treated effluent could go to an outfall or to the Effluent Treatment Facility.

Ion Exchange

A 20 gpm test skid is on site and has been connected to supporting services and tankage. This test facility will be used to conduct test runs in support of Hanford salt pre-treatment programs using simulated Hanford waste. The objective of the test program will be to determine resin physical strength, resin stability, hydraulic degradation, resin fines removal, column pressure drop, resin life, elution characteristics, filtration attributes and resin removal techniques. The bulk of the FY95 funding to support this activity is provided by Hanford with $300,000 provided by SRS.

Appendix A - HLW System Description

High Level Waste

High Level Waste is defined as the highly radioactive waste material that results from the reprocessing of spent nuclear fuel. This includes liquid waste produced directly in reprocessing and any solid waste derived from the liquid. The HLW contains a combination of transuranic waste and fission products in concentrations requiring permanent isolation.

SRS liquid waste, as received in the waste tanks, is made up of many waste streams generated during the recovery and purification of transuranic products and unburned fissile material from spent reactor fuel elements. The waste is neutralized to excess alkalinity (pH 10 to 13) before transfer to the Tank Farm underground storage tanks.

HLW is segregated in the F and H-Area Canyons according to radionuclide and heat content. High Heat Waste (HHW) is primarily generated during the first extraction cycle in the Separations Canyon and contains a major portion of the radioactivity. Low Heat Waste (LHW) is primarily generated from the second and subsequent extraction cycles in the Canyons. HHW is aged at least one year in receipt tanks to reduce the concentration of short-lived radionuclides before evaporation.

Waste Tanks

Waste Management operates 51 waste tanks and 2 evaporators (two other evaporators have been retired and there are no plans to reactivate them) for the purpose of safely storing and volume reducing liquid radioactive waste. The major waste streams into the F and H-Area Tank Farms include HHW, LHW, receipts from RBOF, and DWPF recycle (future). Other major miscellaneous inputs internal to the Tank Farm include additions and byproducts of processes required for preparation of DWPF feed such as sludge washwater, sludge removal decant water, sludge aluminum dissolution washwater, tank interior and annulus spray washing, inhibitor additions for corrosion control, caustic used for aluminum dissolution, and recycle of washwater from the planned Late Wash facility.

Of the 51 tanks, 29 are located in the H-Area Tank Farm and the remainder are located in the F-Area Tank Farm. All of the tanks were built of carbon steel inside reinforced concrete containment vaults, but they were built with four different designs. The newest design (Type III) has a full-height secondary tank and forced water cooling. Two designs (Types I and II) have five foot high secondary annulus "pans" and forced cooling. The fourth design (Type IV) has a single steel wall and does not have forced cooling.

Appendix A - HLW System Description

Evaporators

Each Tank Farm has two single-stage, bent-tube evaporators that are used to concentrate waste following receipt from the Canyons. HHW is segregated and allowed to age before evaporation. The aging allows separation of the sludge and supernate and also allows the shorter-lived radionuclides to decay to acceptable levels. LHW is sent directly to an evaporator feed tank. The sludge settles to the bottom of the feed tank, and the supernate can be processed immediately through the evaporator. Salt crystallized from high-heat waste and low-heat waste is also segregated in separate tanks because the high-heat waste salt must be stored for a number of years (up to 12 years), primarily to allow decay of ^{106}Ru before ITP/DWPF/Saltstone processing. The low-heat waste can be processed in 0 to 3 years.

Radioactive waste, as received and stored in the Tank Farms, can be reduced to about 25% of its original volume and immobilized as crystallized salt by successive evaporation of the liquid supernate. Such a dewatering operation has been carried on routinely in F-Area since 1960 and in H-Area since 1963. Since the first evaporator facilities began operation in 1960, approximately 105,000,000 gallons of space has been reclaimed. Seventy additional waste tanks valued at more than $50 million each would have been required to manage this waste had evaporation not been used.

The 2F Evaporator currently processes high and low-heat waste. The 2H Evaporator processes low-heat waste only. The 1H and 1F Evaporators are planned to remain down. Another evaporator, the Replacement High Level Waste Evaporator (RHLWE), is being constructed to enable the Tank Farm to process future waste loads. The new evaporator will have more than twice the capacity of the 2H and 2F Evaporators and will be able to accept the DWPF recycle (a low activity waste stream of about 1.5 to 3.6 million gallons per year that contains very little solids) in addition to high-heat waste.

Each evaporator is equipped with a Cesium Removal Column (CRC) located in a riser through the top of a waste storage tank. These columns remove cesium from the evaporator overheads condensate produced by the concentration of waste supernate. The columns are normally maintained off-line and placed in service only if required to reduce the cesium concentration prior to transferring the condensate to the Effluent Treatment Facility. The CRC is capable of achieving cesium decontamination factors of 10 to 200 depending on the cesium concentration of the feed. When the zeolite becomes fully loaded, it is discharged directly to the waste tank and replaced.

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Waste Removal Program

The primary objective of the High Level Waste System is shifting from waste storage to removal of radioactive waste from the older style tanks to prepare the waste, including liquid, salt, and sludge, for feed to the DWPF. The waste removal program includes removal of salt and sludge by mechanical agitators, cleaning the tank interior by spray washing of the floor and walls, and steam/water cleaning of the tank annulus if necessary. The waste processing program includes decontamination of the salt and liquid for incorporation into saltstone and aluminum dissolution and washing of the sludge for feed to the DWPF.

The schedules for waste removal and waste processing are closely linked to each other and with the DWPF schedule. The scheduling objective is to remove the waste from the Types I, II, and IV Tanks as rapidly as possible without exceeding the capacity of the Tank Farm processes or the DWPF.

Processes and equipment for waste removal and waste processing have been developed and demonstrated in several successful full-scale radioactive demonstrations. Sludge removal by hydraulic slurrying and chemical cleaning with oxalic acid has been demonstrated in Tank 16. Salt removal and sludge removal using mechanical agitation has also been demonstrated on Tanks 15, 17-22 and 24. Facilities have been designed using data and experience gained from these demonstrations. To date, 2.3 million gallons of salt and 1.1 million gallons of sludge have been removed from Types I, II, and IV Tanks.

The Waste Removal Program is a series of projects that install waste removal equipment on the existing waste tanks. The objective of the Waste Removal Program is to remove the waste contained in the tank primary vessel so that the tank can be reused or retired. In general, the Type III tanks will be reused while the Type I, II and IV tanks will be retired when all waste has been removed. The tanks to be retired will also undergo a water washing operation in the primary vessel and an annulus cleaning operation in the annulus if the annulus is contaminated.

Waste removal equipment consists of slurry pump support structures above the tank top, slurry pumps (typically three for salt tanks and four for sludge tanks), bearing water and electrical service to the slurry pumps, motor and instrument controls, tank sampling equipment, tank interior water washing piping and spray nozzles, pressurized wash water supply skids and H&V skids to augment the existing tank H&V during spray washing.

On salt tanks, the slurry pump discharges are positioned just above the saltcake level. Water is added to the tank, the slurry pumps are started and salt is dissolved. The dissolution ratio is typically 2 parts water to 1 part saltcake although this can vary

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up to 4 parts water per 1 part saltcake. The slurry pumps serve to displace the boundary layer of saturated water in contact with the saltcake and expose the underlying salt to unsaturated water. When the water is fully saturated, the dissolved salt solution is transferred to ITP, the slurry pumps are lowered and the process is repeated.

On sludge tanks, the four slurry pumps are typically positioned in the top layer of sludge, water is added and the pumps are started. When the layer of sludge is well mixed (i.e. the sludge is suspended) as indicated by sampling, the transfer pump is started and the suspended sludge is transferred to ESP. Note that the slurry pumps continue to operate during the transfer so that the suspended sludge does not resettle. The pumps are then lowered, more water is added, and the process is repeated. Sludge tanks require more pumps than salt tanks because the sludge must be agitated vigorously to suspend the sludge particles as opposed to dissolving saltcake.

For tanks that contain mixed salt and sludge, the salt will be removed followed by the sludge. The process is similar to salt removal described above except that the sludge is allowed to resettle before the saturated salt solution is transferred out of the tank.

When the salt or sludge contents have been removed from the old-style tanks, the tank interior is washed with heated water. The water is sprayed throughout the tank using rotary spray jets installed through the tank risers. The water is supplied to the jets by a skid mounted tank and pump system. For those tanks with contaminated annuli, recirculating jets are installed in the annulus through annulus risers and heated water is circulated in the annulus and then transferred to the waste tank primary. At the completion of water washing, there may be some residual waste that cannot be removed with water. Removal of this waste is not part of the scope of the existing Waste Removal Program and will be handled on a case-by-case basis as the Transition and Decontamination & Decommissioning missions are developed. Oxalic acid cleaning has been demonstrated in Tank 16 as a viable process to remove residual waste.

New Waste Transfer Facility

The NWTF is currently undergoing final startup testing activities. The facility consists of four pump tank cells and a large diversion box cell located inside a building outfitted with a remotely operated crane. This facility is the hub for transfers between the F-Area Tank Farm, the H-Area Tank Farm, and DWPF. It is currently scheduled to begin hot tie-ins in mid-1995 and hot operation in late 1995. The NWTF will replace the HDB-2 complex. It's primary mission will be to serve as a highly reliable and flexible receipt and distribution point for the DWPF recycle and Intra-Tank Farm streams.

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F/H Interarea Line

The F/H IAL connects the F-Area and H-Area Tank Farms. The IAL is approximately 2.2 miles long with a high point at the middle and low points at each end. The line segments terminate at the high point in a small diversion box-type structure that is used to flush and/or vent the transfer lines. Flushing capability is provided by a portable 10,000 gallon tank that is filled by truck. The line segments that terminate at the low points do so in FDB-2 and HDB-2. These diversion boxes can be configured such that any tank in either Tank Farm can be transferred to any tank in the other Tank Farm.

The IAL piping consists of two three inch diameter core pipes inside of individual four inch diameter jackets. The core pipes are constructed of 304L stainless steel while the jackets are carbon steel. The jackets are supported by concrete pedestals bearing on a concrete pad that runs the length of the IAL. There is also a protective concrete pad overlaying the IAL. The piping and concrete structures are below grade.

The IAL is currently out of service due to process support deficiencies in F and H-Areas. When the NWTF starts up, the H-Area end of the IAL will be disconnected from HDB-2 and connected to HDB-8. At that time, H-Area to F-Area transfers will be possible using the NWTF control and support systems. F-Area to H-Area transfers will not be possible until the F-Area support system is upgraded. This is currently planned to be handled as a Division Managed Task. This task has been scoped, however, it needs to be scheduled and cost estimated.

Once the IAL is fully operational, all F-Area waste will eventually be transferred to the H-Area ITP and ESP facilities for further processing. Also, H-Area HHW and future dilute waste from DWPF (recycle) and ESP (spent washwater) will be transferred to F-Area as feed for the 2F Evaporator.

At one time, there was a Line Item project to upgrade the IAL. The scope of this project was to install a containment building and remotely operated crane on the high point vent valve box. The justification for this project was based upon improved contamination control, particularly alpha contamination, during maintenance. This project did not involve replacing the IAL or any significant piping modifications. A FY93 Reprogramming action cancelled this project and reallocated the funding to Late Wash. The basis for cancelling the project was the infrequent need to perform maintenance in the high point vent valve box and the need to fund Late Wash.

Diversion Box & Pump Pit Containment

This project provides a containment building outfitted with a remotely controlled crane for H-Area Diversion Box 7 (HDB-7) similar to the building for the NWTF

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described above. HDB-7 is the hub for all transfers within H-Area as required to support H-Canyon, ITP, ESP and the 2H Evaporator. This project increases the reliability and utility of HDB-7 as well as reduces radiation exposure to personnel during routine maintenance.

There will be a period of time when this project could effect the other operations listed above. This period starts when the building steel is erected and finishes when the facility becomes operable. Building steel will interfere with a yard crane if maintenance is required inside HDB-7. This time period will be the subject of additional planning. It is shown on the Integrated Schedule as a "window of vulnerability". If there are no leaks or jumper failures during this time, then there would be no need to enter HDB-7 and thus no impact to other operations.

Extended Sludge Processing

Sludge that is removed from waste tanks is washed in the ESP facility to reduce the concentration of soluble salt in the sludge before it is fed to the DWPF. Sludge processing includes four processing steps: 1) aluminum dissolution (required for H-Area HHW sludge) using sodium hydroxide and elevated tank temperature, 2) washing with inhibited water to remove dissolved solids, 3) gravity settling, and 4) decanting the salt solution to the Tank Farm for evaporation. Before washing, H-Area HHW sludge is transferred to Tank 42 and then mixed with sodium hydroxide to dissolve excess aluminum. The quantity of aluminum in other waste tanks is low and therefore does not require aluminum dissolution.

After aluminum dissolution in Tank 42, subsequent processing steps are conducted using two of three tanks (40, 42 and 51) that are rotated in round-robin fashion. For Sludge Batch 1, Tanks 42 and 51 will be used to wash sludge concurrently, with the wash water from the first tank being reused to wash the sludge in the second processing tank. When all washing is complete, the sludge is consolidated into one tank (Tank 51) to be fed to the DWPF. Processing begins again using a third tank (Tank 40) for co-processing with the empty tank from the prior batch (Tank 42).

Four slurry pumps in each processing tank supply the agitation for washing. Washwater that results from this process will either be transferred to an evaporator system or stored for reuse to dissolve saltcake, depending on the salt concentration. Tanks 21 and 24, both Type IV tanks, will be used for staging this washwater.

In-Tank Precipitation

Salt will be removed from the waste tanks and processed via ITP. ITP conducts a precipitation/adsorption reaction with sodium tetraphenylborate and sodium titanate in Tank 48. The resultant precipitate slurry is continuously

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pumped to a filter cell, filtered, and then returned to Tank 48. Filtering is continued until the precipitate reaches 10 wt % solids. The filtrate produced during the filtering step is collected, stripped of benzene, sampled and then pumped to Saltstone to be incorporated into a cement/flyash/furnace slag grout. The concentrated precipitate is washed to reduce the sodium content using the same filters as before and then transferred to Tank 49 for feed to DWPF. At DWPF, the washed precipitate is blended with washed sludge and incorporated into the glass product. ITP is the only currently planned process to remove salt from the Tank Farm inventory and thus keep the Tank Farm from becoming "saltbound".

F/H Effluent Treatment Facility

Low level aqueous streams currently sent to the F/H ETF from the 200-Areas consist of: segregated cooling water, contaminated surface runoff from the Tank Farms, some evaporator overheads, cesium removal column effluent, condensate from the Separations general purpose evaporator and acid recovery units located in Building 211-F, selected liquid regeneration wastes from the resin regeneration facility in H Area, and water collected in the H-Area catch tank from transfer line encasements.

The F/H ETF treats the waste water that was previously sent to seepage basins. The treatment process includes pH adjustment, filtration, organic removal, reverse osmosis, and ion exchange. The facility consists of process waste water tanks, treated water tanks, basins to collect contaminated cooling water and storm water runoff and a water treatment facility.

Facilities had not previously been available for treating all types of contaminated water releases from the Canyons nor were there facilities to send contaminated water in the retention basins to the Tank Farms for storage and/or treatment via the Tank Farm evaporators. The F/H ETF corrected this by providing treatment facilities for all types of low-level waste water.

The ETF has been used to support DWPF Cold Chemical Runs. Water and cold chemicals used in the DWPF Cold Chemical Runs test program after melter heatup have been trucked to the ETF because this stream could not meet the acceptance criteria of Horse Creek Valley, a local Publicly Owned Treatment Works. The Mercury Runs test program generates a similar waste stream that is spiked with trace amounts of mercury. In the past, this stream was to be trucked to the Tank Farm. Studies conducted by SRTC have shown that it is feasible to process this stream in the ETF. There is an aggressive program underway to make the necessary piping and process changes to enable the ETF to process the mercury runs recycle.

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Defense Waste Processing

The DWPF consists of several facilities: the Vitrification process (commonly called DWPF), Saltstone, and Late Wash. These facilities will be discussed below. These facilities require several recurrent projects to maintain operations: additional Glass Waste Storage Buildings, Saltstone Vaults, Glass Melters, and Failed Equipment Storage Vaults (used to store failed melters and other large equipment). The recurrent facilities will not be discussed but will be shown on the Integrated Schedule and in Appendix N.

Late Wash Facility (LW)

The Late Wash Facility, located at the former Auxiliary Pump Pit, will receive washed precipitate stored in ITP Tank 49. Late Wash will reduce the nitrite concentration from the precipitate by a filtration/dilution process in a stainless steel facility utilizing a crossflow filter. Sodium nitrite is added to ITP to mitigate pitting corrosion of carbon steel waste tanks and components. Nitrite, if not removed in Late Wash, results in high boiling organics in the DWPF process which foul heat transfer surfaces and plug filters and instrumentation. The Late Wash batch operation is designed to process approximately 3,400 gallons of precipitate every 43 hours. During the process, cesium in the slurry which has returned to solution during Tank 49 storage is reprecipitated, re-concentrated to 10 wt %, and washed to remove the nitrite from the slurry to ≤ 0.01M using a filtration process. The washed slurry is transferred to the Low Point Pump Pit for subsequent transfer to the DWPF. The filtrate produced during the filtering process is stripped of benzene, chemically adjusted, and transferred to Tank 22 for reuse in the ITP process.

Vitrification (DWPF)

The objective of the DWPF Vitrification process is to receive the liquid high-level radioactive waste which is processed in ITP and ESP and permanently immobilize it as a glass solid. The vitrification operations include chemically treating two unique waste streams, mixing them with ground borosilicate glass and then heating the mixture in a Joule heated melter to 1,130 degrees centigrade. The molten mixture is then poured into ten foot tall by two foot diameter stainless steel canisters and allowed to harden. The outer surface of each canister is then decontaminated to Department of Transportation standards, welded closed and temporarily stored onsite for eventual transport to and disposal in a permanent federal geological repository.

Saltstone (Z-Area)

The Z-Area Saltstone facility processes low-level radioactive liquid waste salt solution from the In-Tank Precipitation Facility and the Effluent Treatment Facility. The solution is mixed with a blend of cement, flyash and blast furnace slag to form a grout.

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The grout is pumped in disposal vaults where it hardens into a solid non-hazardous waste form for permanent disposal.

Solid Waste

Consolidated Incineration Facility (CIF)

The CIF, while not currently a portion of the HLW System, will play an important role in the success of the waste removal mission in the future. Benzene generated from the DWPF processing of the ITP precipitate will be incinerated in the CIF.

The CIF is being built to treat various site-generated combustible waste before final disposal and to reduce the volume of the current inventory of waste stored at SRS. The waste to be treated will include waste defined as hazardous by South Carolina Hazardous Waste Management Regulations and federal RCRA regulations, waste contaminated with low levels of beta-gamma radioactivity, and mixed waste that is both hazardous and low-level radioactive. The facility will not treat waste containing dioxins or polychlorinated biphenyls.

Facilities to be provided on the CIF project consist of a main process building which includes an area for boxed waste receipt and handling, a rotary kiln incinerator, ash removal, offgas cleaning, control room and support facilities. The rotary kiln primary combustion chamber will be used for the incineration of solids and various organic and aqueous liquid wastes. A secondary combustion chamber will also incinerate organic solvent waste as well as destroy any remaining trace hazardous constituents in the primary offgas. Offgas exiting the secondary combustion chamber will be cooled and treated by a wet offgas treatment system. Pollutants in the offgas will be removed to below regulatory limits before the offgas is discharged to the atmosphere.

Appendix B.1 - HLW System Safety Documentation

Process	Safety Documents	Comments
F and H Tank Farm	1, 8, 9, 10, 14, 15, 17, 20, 21, 22, 23, 25	
Evaporators	1, 8, 9, 10, 14, 15, 20, 21, 22, 23, 25	
Replacement High Level Waste Evaporator	1, 8, 9, 10, 14, 15, 20, 21, 22, 23, 25	Additional RHLWE-specific safety documentation will be developed.
Sludge Waste Removal	1, 8, 9, 10, 14, 15, 20, 21, 22, 23, 24, 25	
Salt Waste Removal	1, 8, 9, 10, 14, 15, 20, 25, 26	
Extended Sludge Processing	1, 7, 8, 9, 12, 14, 15, 17, 20, 23, 24, 25, 28	
In-Tank Precipitation	1, 6, 7, 8, 9, 11, 14, 15, 17, 18, 19, 20, 25, 26, 27	
Defense Waste Processing Facility	2, 3, 13	DWPF safety documentation will transition from the CCR Safety Envelope to a complete SAR as facility startup testing proceeds.
Saltstone	4, 16	A JCO is in effect until the SAR is approved by DOE.
F/H Effluent Treatment Facility	29, 30	Current authorization basis for ETF is that it will be maintained as a Low Hazard facility.
Transfer Facilities (New Waste Transfer Facility, Diversion Boxes, Inter-Area Lines, Pump Pit Facilities)	1, 8, 9, 10, 14, 15, 20, 21, 22, 23, 25, 32	
Consolidated Incineration Facility	5	An SAR is in the review and approval cycle.
299-H Maintenance Facility	14, 31	Current authorization basis for 299-H Maintenance facility is that it will be maintained as a Low Hazard facility.

Appendix B.1 - HLW System Safety Documentation

Note: The following list contains the primary nuclear safety documents associated with the High Level Waste System. It is not intended to be an all-inclusive list.

Safety Analysis Reports

1. DPSTSA 200-10, SUP18, August 1988
   Safety Analysis - 200 Area Savannah River Plant Separations Area Operations/
   Liquid Radioactive Waste Handling Facilities

2. DPSTSA 200-10, SUP-20
   Safety Analysis, 200 S-Area, Savannah River Site, Defense Waste Processing Facility, Operations

3. WSRC-RP-92-975, Rev. 2, April 15, 1994
   Defense Waste Processing Facility, Safety Envelope

4. WSRC-SA-3, DOE Review Draft, September 1992
   Safety Analysis Report, Z-Area, Savannah River Site, Saltstone Facility

5. WSRC-SA-17 (Draft), December 1993
   Safety Analysis Report, Savannah River Site, Consolidated Incinerator Facility

6. WSRC-RP-94-303, Rev. 0, June 1994
   241-82H Control Room

Addenda to Safety Analysis Reports

7. WSRC-SA-15, Rev. 4, June 1994
   Addendum - 1, Additional Analysis for DWPF Feed Preparation by In-Tank Precipitation
   (Addendum to DPSTSA 200-10, SUP 18)

8. WER-WME-921136, Rev. 7, December 29, 1993
   Tank Farm SAR Addendum Database (Error Corrections List)

Appendix B.1 - HLW System Safety Documentation

Operational Safety Requirements

9. DPW-86-103, Rev. 1, February 1989
Operational Safety Requirements for Waste Management Operations

10. WSRC-RP-92-1044, Rev. 0, January 1994
Interim Operational Safety Requirements for F and H-Area High Level Radioactive Waste Tank Farms

11. WSRC-RP-90-1124, Rev. 3, June 1993 (WSRC Approved)
Operational Safety Requirements In-Tank Precipitation Process

12. WSRC-RP-93-224, Rev. 1, August 1993 (WSRC Approved)
Operational Safety Requirements Extended Sludge Processing

13. WSRC-RP-92-838, Rev. 1
Cold Chemical Runs Operational Safety Requirements

Basis for Interim Operations/Justification for Continued Operation

14. WSRC-RP-92-964, Rev. 0, January 1994
Savannah River Site Liquid Radioactive Waste Handling Facilities - Justification for Continued Operation

    Note: DOE approved this document for interim use while the Basis for Interim Operations is being developed.

15. SR-HLW-93-1736, Attachment 4, September 1993
Hydrogen Deflagration in HLW Tank 241-FH (Attachment to HLW-930743)
Expires May 1, 1994

    Note: An extension of the JCO was requested with authorization basis change noted in HLW-OVP-940058 that replaces this JCO.

16. WSRC-RP-92-444, March 31, 1992
Justification for Continued Operation of the SRS Saltstone Facilities (Z-Area)

Appendix B.1 - HLW System Safety Documentation

17. HLW-OVP-940021, Revision 1, March 7, 1994
"Justification for Continued Operations of the H-Tank Farm with the Current Seismic Safety Basis,"
Expires approximately one year from date of issuance.

    Note: Expiration date will be updated periodically as new technical information becomes available from the "H-Area/ITP Seismic Safety Issues Resolution Program Plan (U)," HLW-ENG-930017, Rev. 1, dated Jan. 31, 1994.

Test Authorizations

18. WSRC-OX-89--15-001, Rev. 6, June 8, 1994
Tank 50H to Saltstone Transfer
Expires June 8, 1995

19. WSRC-TA-91-0005-11, Rev. 2, March 25, 1994
Tank 48/49 Nitrogen Purge
Expires September 30, 1994

Technical Standards

20. DPSTS-241, Rev. 2, February 1992
Technical Standard - Waste Tank Farms

Safety Evaluations and Other Documents

21. SR-HLE-93-341, February 1993
USQD - Potential Inadequacy in the Authorization Basis for Criticality Safety in the Waste Evaporators

22. WSRC-TR-93-081, February 1993
Evaluation of Potential Accumulation of Uranium and/or Plutonium in the HLW Evaporator System

23. SR-HLE-93-557, March 1993
USQD - Potential Inadequacy in the Authorization Basis for Criticality Safety Involving Evaporation of ESP Batch One Wash Water

Appendix B.1 - HLW System Safety Documentation

24. WSRC-TR-93-115, February 1993
Nuclear Safety of Extended Sludge Processing on Tank 42 and 51 Sludge (DWPF Sludge Feed Batch One)

25. SR-HLE-93-1736, September 1993
USQD - Hydrogen Deflagration in HLW Tank 241-F & H

26. WSRC-TR-93-171, March 1993
Nuclear Criticality Safety Bounding Analysis for the In-Tank Precipitation (ITP) Process

27. WSRC-TR-92-427, Rev. 3, June 1994October 1993
Safety Evaluation of the ITP Filter/Stripper Test Run and Quiet Time Run Using Simulant Solution (U)

28. WSRC-TR-93-207, Rev. 1, August 1994
Safety Evaluation of the ESP Sludge Washing Baseline Runs

29. WSRC-TR-93-031, Rev. 1, April 1993
Hazards Assessment Document Effluent Treatment Facility Balance of Plant

30. SRL-NPS-920001, Rev. 1, January 1993
Safety Envelop Evaluation of ETF Alarm Failure Incident

31. PHR 200-H-33, Rev. 2, October 1990
Periodic Process Hazards Review

32. WSRC-RP-92-1396, (Draft) (Upon WSRC Approval)
Safety Evaluation for the New Waste Transfer Facility

Appendix B.2 - HLW System Environmental Documentation

Process	Environmental Documents	Comments
F and H Tank Farm	1, 2, 6, 10, 18, 19, 24, 25, 26, 34, 35	
Evaporators	1, 2, 6, 10, 18, 19, 24, 25, 26, 34, 35	
Replacement High Level Waste Evaporator	1, 2, 6, 10, 28	
Sludge Waste Removal	1, 2, 6, 10, 18, 19, 24, 25, 26, 34, 35	
Salt Waste Removal	1, 2, 6, 10, 18, 19, 24, 25, 26, 34, 35	
Extended Sludge Processing	1, 2, 6, 10, 18, 19, 25, 34	
In-Tank Precipitation	1, 2, 6, 10, 18, 20, 24, 25, 34	
Defense Waste Processing Facility	3, 4, 5, 7, 8, 9, 11, 14, 16, 21, 23, 24, 30, 37	
Saltstone	3, 8, 12, 16, 22, 24, 31, 33, 38	
F/H Effluent Treatment Facility	1, 2, 13, 15, 24, 29, 36	
Transfer Facilities (New Waste Transfer Facility, Diversion Boxes, Inter-Area Lines, Pump Pit Facilities)	NWTF: 1, 2, 10, 24, 27 All Others: 1, 2, 6, 8, 10, 18, 19, 24, 25, 26, 34, 35	
Consolidated Incineration Facility	1, 7, 8, 16, 17, 24, 32	

Note: The following list contains the primary environmental documents associated with the High Level Waste System. It is not intended to be an all-inclusive list.

Appendix B.2 - HLW System Environmental Documentation

National Environmental Policy Act:

1. ERDA-1537, "Final Environmental Impact Statement - Waste Management Operations - Savannah River Plant - Aiken, South Carolina."

2. DOE-EIS-0062, "Final Environmental Impact Statement - Supplement to ERDA-1537 - Waste Management Operations, Savannah River Plant, Aiken, South Carolina - Double Shelled Tanks for Defense High Level Radioactive Waste Storage."

3. DOE-EIS-0082, "Final Environmental Impact Statement - Defense Waste Processing Facility - Savannah River Plant, Aiken, South Carolina "

4. DOE/EIS-0082-S-D, "Draft Supplemental Environmental Impact Statement, Defense Waste Processing Facility, August 1994, Department of Energy, Savannah River Site, Aiken, South Carolina

5. DOE-EA-0179, "Environmental Assessment - Waste Form Selection for SRP High-Level Waste"

Federal Facility Agreement:

6. Savannah River Site Federal Facility Agreement, Administrative Docket Number: 89-05-FF, effective August 16, 1993.

Land Disposal Restriction-Federal Facility Compliance Agreement:

7. Federal Facility Compliance Agreement; Savannah River Site, EPA Docket #91-01-FFR, EPA ID #SCI 890 008 989, March 13, 1991.

Resource Conservation and Recovery Act:

8. RCRA Part A Permit #SC1890008989 for Savannah River Plant, June 30, 1987.

9. RCRA Part B Permit Application for the Organic Waste Storage Tank, Volume VI, Interim Status.

Appendix B.2 - HLW System Environmental Documentation

South Carolina Department of Health and Environmental Control Industrial Wastewater Permit

10. Permit #17,424-IW: F/H Area Tank Farms, March 3, 1993.
11. Permit #16783: Vitrification Facility, August 14, 1992.
12. Permit #12683: Saltstone Facility, July 18, 1988.
13. Permit #12870 and Addendums: Effluent Treatment Facility, September 30, 1988.
14. Permit #17,596-IW, Late Wash, December 2, 1993

National Emission Standard for Hazardous Air Pollutants

15. A033677, NESHAP Approval for Construction of the Effluent Treatment Facility; March 17, 1988.
16. EPA NESHAP Approval for Construction of ITP and DWPF; April 25, 1988.

South Carolina Department of Health and Environmental Control Air Quality Control Permit

17. Permit #0080-0041-H-CG for the Consolidated Incinerator Facility, November 25, 1992.
18. Permit #0080-0041, Permit to Operate Seven (7) Diesel Generators at Waste Management Facilities in H-Area; May 18, 1993.
19. Permit #00800-0045, Permit to Operate Five (5) Diesel Generators at Waste Management Facilities in F-Area; February 20, 1990.
20. Air Quality Control Construction Permit #0080-0046-CE for Diesel Generator at the ITP Facility (241-4H).

Appendix B.2 - HLW System Environmental Documentation

South Carolina Department of Health and Environmental Control Air Quality Control Permit (con't)

21. Air Quality Control Permit #0080-0066 and Addendums, (DWPF Canyon Exhaust Stack); August 1993.

22. Air Quality Control Permit #0080-0080 and Addendums, (Z-Area Standby Diesel); October 9, 1989.

23. Permit #0080-0041-H-CH, Late Wash [DWPF]; August 18, 1994

National Pollution Discharge and Elimination System

24. Permit # SC000175, NPDES Permit for Savannah River Site; September 24, 1986.

South Carolina Department of Health and Environmental Control Domestic Water Permit

25. Permit SC#405556: H-Area Facilities; April 21, 1988.

26. Permit SC#405566: F-Area Facilities; May 3, 1988.

27. Permit SC#401118: New Waste Transfer Facility; April 18, 1988.

28. Permit SC#LS91007: Replacement High Level Waste Evaporator; May 2, 1991.

29. Permit SC#LS-233-W: Effluent Treatment Facility.

30. Permit SC#402186 and Addendums: Defense Waste Processing Facility, Domestic Water Distribution, Tank and Treatment; June 30, 1989.

31. Permit SC#400737: Saltstone, Domestic Water Lines and Tank; May 26, 1988.

32. Permit #M0023E1: 261-H CIF Domestic Water Permit; April 5, 1994.

Appendix B.2 - HLW System Environmental Documentation

South Carolina Department of Health and Environmental Control Landfill Permit

33. Permit #IWP-217, Saltstone Solid Waste Disposal Site, approved October 17, 1989.

South Carolina Department of Health and Environmental Control Sanitary Water Permit

34. Permit #12910 and Addendum: H-Area Facilities.

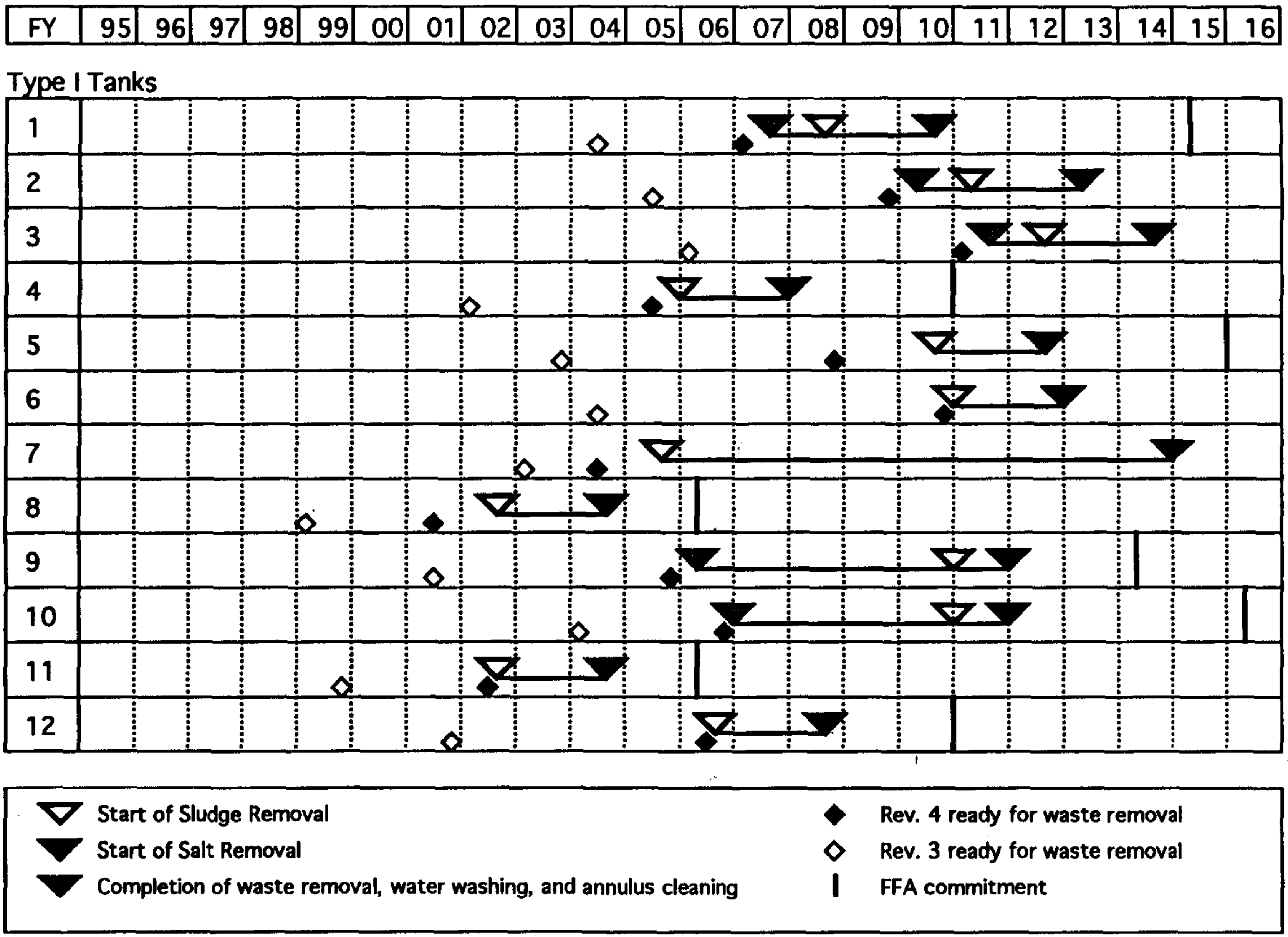
35. Permit #9326 and Addendum: F-Area Facilities.

36. Permit #9998 and Addendum: Effluent Treatment Facility.

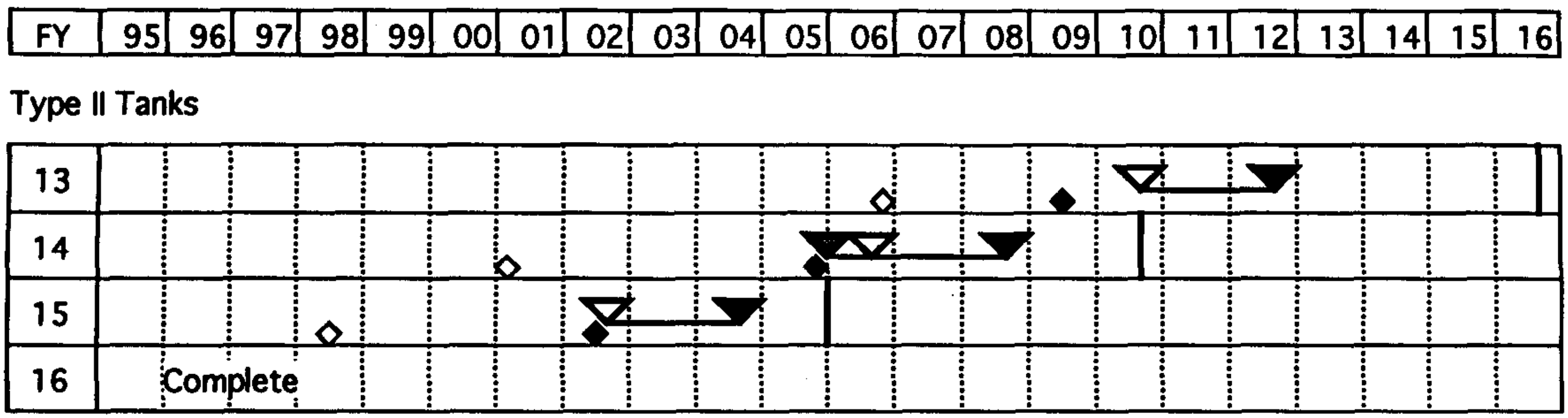
37. Permit #9888 and Addendum: Defense Waste Processing Facility; July 2, 1985.

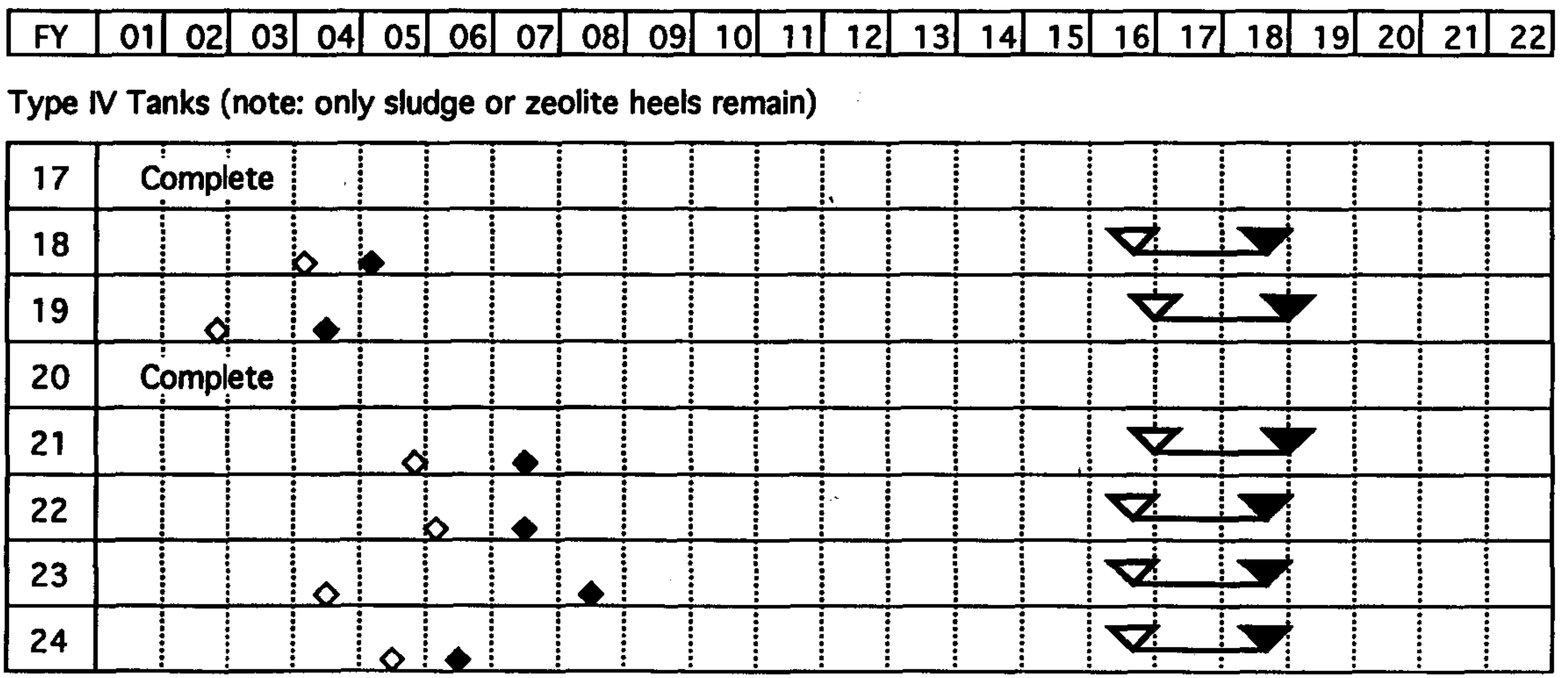
38. Permit #13717: Saltstone, May 23, 1988.

Appendix C.1 - Type I, II & IV Tank Waste Removal Schedule

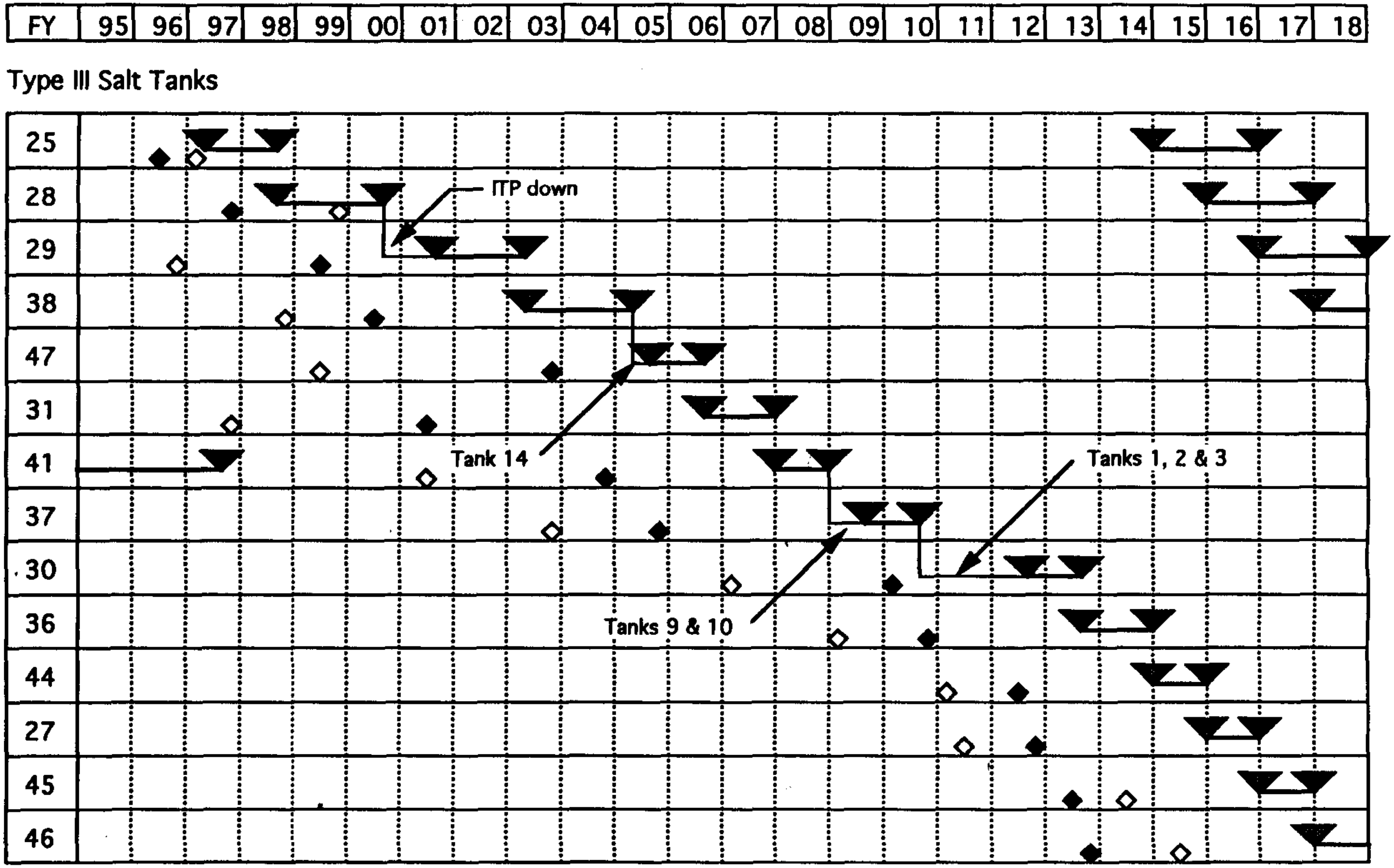


Appendix C.1 - Type I, II & IV Tank Waste Removal Schedule

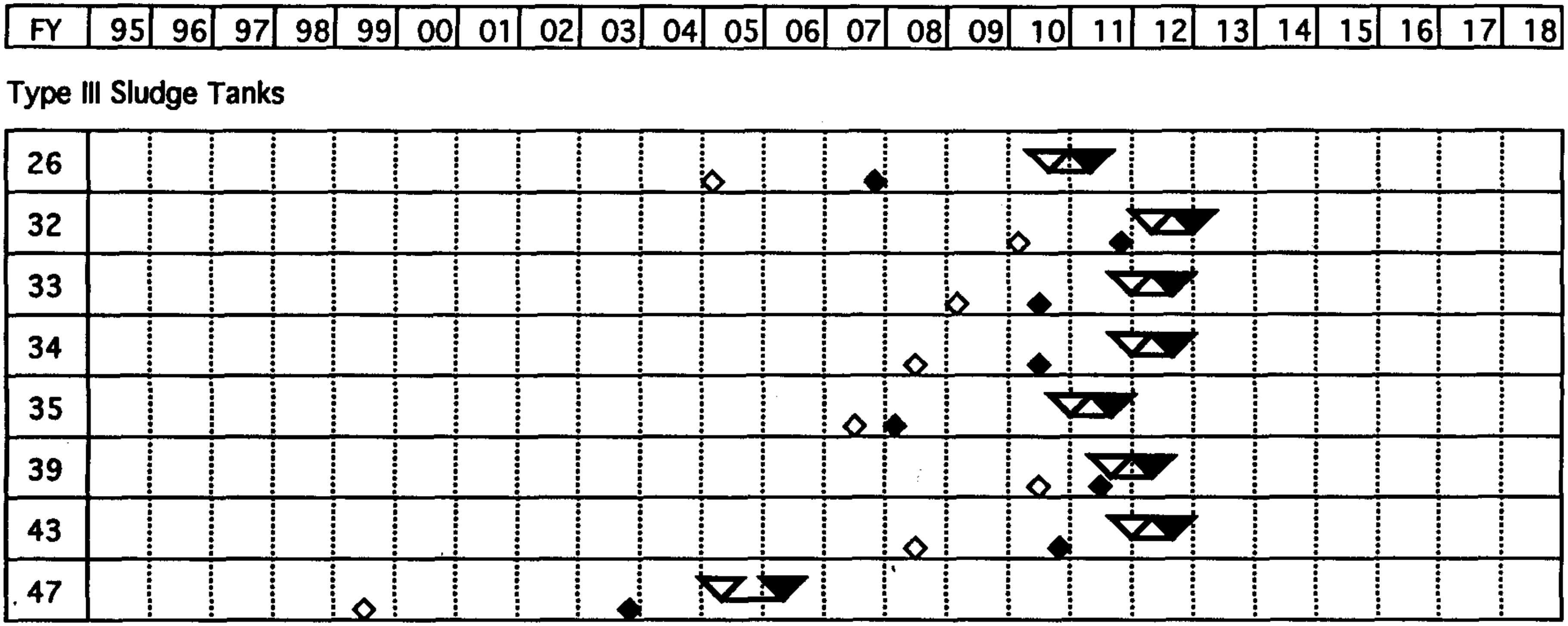




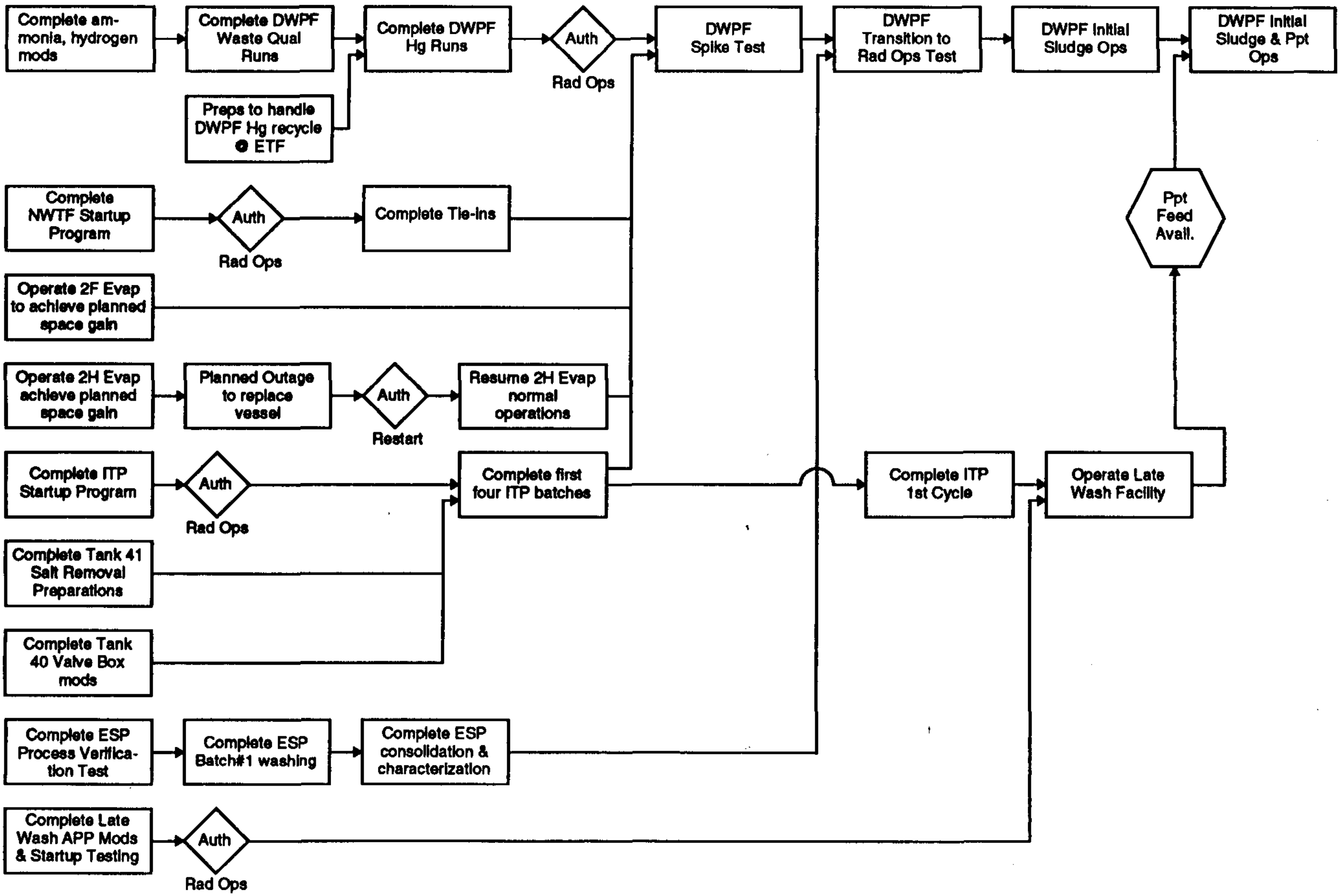
Appendix C.2 - Type III Tank Waste Removal Schedule



Appendix C.2 - Type III Tank Waste Removal Schedule



Appendix D - Process Logic Diagram



Appendix E - Process Logic Interactive Matrix

Process	Limiter	Solution	Dependent Upon
1. **Sludge Waste Removal**	1. Funding 2. Qualified manpower 3. Blending requirements 4. ESP processing rate 5. Evaporator capacity 6. Analytical lab capacity	1. Productivity improvements; slow down program 2. Maintain funding for core TEC and OPC groups 3. Continue to model batches; improve models 4. Complete ESP PVT to generate useful data 5. Tie the start of processing sludge batch #2 to the startup of the RHLWE 6. Complete ongoing study evaluating lab capacity vs needs, take corrective actions	1. Creativity, flexibility, willingness to accept alternatives or prolonged program 2. Ability to attract and keep qualified workers 3. Quality of sample data & analyses and models 4. Sludge settling time 5. Funding for the RHLWE 6. Priority of completing study vs other needs
2. **Salt Waste Removal**	1. Funding 2. Qualified manpower 3. Saltstone requirements 4. ITP startup date 5. ITP processing rate 6. ITP feed requirements 7. DWPF startup and processing rate 8. Analytical lab capacity	1. Productivity improvements; slow down program 2. Maintain funding for core Operations & Engg group 3. Sample salt tanks and blend 4. Provide full funding, complete ORR and start up asap 5. Complete evaluations at end of first three batches and first wash 6. Sample salt tanks and blend accordingly, evaluate higher Ci concentrations 7. Full fund DWPF and start up asap 8. Complete ongoing study evaluating lab capacity vs needs, take corrective actions	1. Creativity, flexibility, willingness to accept alternatives or prolonged program 2. Ability to attract and keep qualified workers 3. Quality of sample data & analyses and models 4. Funding; extent of ORR findings 5. Funding and qualified engineers to evaluate data 6. Quality of sample data & analyses and models 7. Funding; extent of ORR findings 8. Priority of completing study vs other needs
3. **Evaporation**	1. Available salt receipt space 2. Availability/Utility of evaporators 3. Timely WM EIS ROD	1. Provide funding to support timely salt removal from salt receipt tanks 2. Run ITP to process salt or concentrated supernate removed from salt receipt tanks 3. Develop a high quality WM EIS asap	1. Funding 2. Start up date and processing rate of ITP 3. Availability of support for EIS development, justification for planned action, willingness of the public to accept planned action

Appendix E - Process Logic Interactive Matrix

Process	Limiter	Solution	Dependent Upon
4. **Replacement High Level Waste Evaporator (RHLWE)**	1. Funding 2. Concentrate receipt space with adequate cooling 3. Timely WM EIS ROD	1. Productivity improvements, scope reductions or delayed startup date 2. Do not fill Tank 30 by running 1H Evap., replace cooling coils before filling 3. Develop a high quality WM EIS asap	1. Creativity, flexibility, willingness to accept alternatives or prolonged program 2. Funding for coil replacement and to empty Tk 29 before Tk 30 fills 3. Availability of support for EIS development, justification for planned action, willingness of public to accept planned action
5. **In-Tank Precipitation (ITP)**	1. Funding 2. Startup Authorization 3. Technical Concerns: •Tank 41 Criticality •Deflagration •Geotechnical 4. Available Feed from Salt Tanks 5. Tank 49 not full 6. Saltstone operational 7. Saltstone Vaults 8. Timely DWPF SEIS ROD	1. Do not exceed FY95 AOP funding; use productivity improvements to fund emergent tasks; or slow down program 2. Perform thorough RSA, resolve findings, justify readiness to start up 3. Justify and support studies/technical bases 4. Provide funding for salt removal tanks 5. Start up and operate Late Wash/DWPF; carefully K content of plan ITP feed 6. Provide funding to operate Saltstone 7. Provide adequate funding to construct new vaults 8. Support and justify planned action	1. Creativity, flexibility, willingness to accept alternatives or prolonged program 2. Quality of readiness reviews; willingness of DOE to quickly authorize startup 3. Willingness of oversite groups to accept WSRC/DOE-SR conclusions 4. Funding; other priorities 5. Knowledge of tank contents 6. Funding; other priorities 7. Funding; other priorities; lead time to build vaults 8. Availability of support for SEIS development, justification for planned action, willingness of public to accept planned action

Appendix E - Process Logic Interactive Matrix

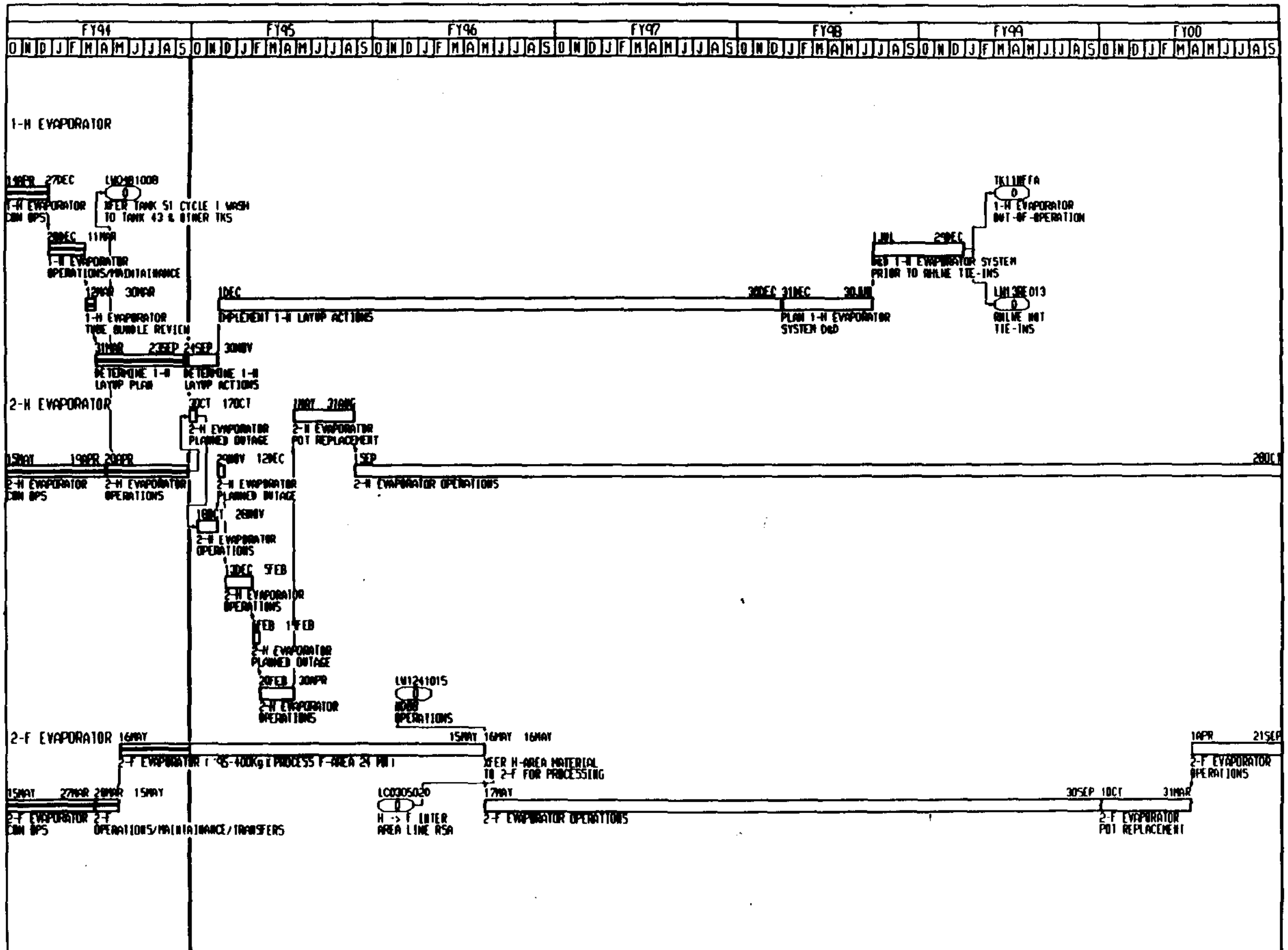
Process	Limiter	Solution	Dependent Upon
6. Extended Sludge Processing (ESP)	1. Manpower 2. Slurry pump seal leakage 3. Completion of PVT 4. Available feed 4. Evaporator capacity 5. DWPF feed specs 6. Timely DWPF SEIS ROD	1. Establish priority, allocate manpower as appropriate 2. Complete PVT; conduct testing/evaluation in parallel; implement fixes 3. Complete PVT on schedule; fund emergent work through productivity improvements 4. Fund and start up RHLWE, reuse washwater as possible 5. Complete development of specs; model batches; adjust accordingly 6. Support and justify planned action	1. Success of ITP startup 2. Successful completion of ITP startup and funding for fixes 3. Successful completion of ITP startup and allocation of resources to ESP 4. Funding 5. Funding; knowledge of tank contents 6. Availability of support for SEIS development, justification for planned action, willingness of public to accept planned action
7. Late Wash (LW)	1. Funding 2. Startup Authorization 3. Technical Concerns: •Filter Operation •Benzene Stripping 4. Tank 22 available for recycle of wash water 5. Feed available from Tank 49 6. Timely DWPF SEIS ROD	1. Prioritize and allocate funding 2. Conduct thorough RSA, resolve findings 3. Complete ongoing process development and testing at TNX and Late Wash Filter Demonstration Unit 4. Complete post-startup actions required to get Tank 22 ready 5. Start up ITP as soon as possible and execute production plan 6. Support and justify planned action	1. Funding 2. Quality of readiness preparations, willingness of DOE to authorize startup 3. Funding, priority 4. Successful ITP startup to free up resources to work on Tk 22 5. ITP startup 6. Availability of support for SEIS development, justification for planned action, willingness of public to accept planned action

Appendix E - Process Logic Interactive Matrix

Process	Limiter	Solution	Dependent Upon
8. Defense Waste Processing Facility (DWPF)	1. Startup Authorization 2. Successful Waste Qual Runs 3. Availability of sludge feed 4. Availability of precipitate feed 5. Tank Farm capable of handling the recycle water 6. Liquid benzene appropriately stored or incinerated 7. Timely DWPF SEIS ROD	1. Conduct quality readiness reviews, thoroughly resolve all findings 2. Complete hydrogen & ammonia mods, start test 3. Complete ESP PVT and batch#1 washing 4. Start up ITP and Late Wash 5. Start up ITP and remove salt from tanks 6. Start up CIF 7. Support and justify planned action	1. Quality of readiness preparations, willingness of DOE to authorize startup 2. Process performance, accuracy of modeling, scale testing 3. Successful ITP startup to reallocate resources to ESP; fixing seal leakage problems 4. ITP startup, funding for STPB 5. Funding for ITP and Waste Removal 6. Regulations and public support 7. Availability of support for SEIS development, justification for planned action, willingness of public to accept planned action
9. Saltstone	1. Single shift operation 2. Vaults 3. Timely DWPF SEIS ROD	1. Fund to staff 2nd shift to match ITP process rate 2. Timely funding and construction of new vaults 3. Support and justify planned action	1. Funding, headcount ceiling 2. Funding, ITP process rate 3. Availability of support for SEIS development, justification for planned action, willingness of public to accept planned action
10. F/H Effluent Treatment Facility (ETF)	1. Feed acceptance criteria 2. Operational utility 3. Tank 50 not full 4. Ready to receive DWPF Hg Runs Recycle 5. Timely WM EIS ROD	1. Establish & maintain controls on generators 2. Implement utility improvements as required 3. Operate Saltstone 4. Implement vendor proposal to pretreat Hg recycle 5. Support and justify planned action	1. Evaporator operations 2. Funding 3. Saltstone funding 4. Funding, priority 5. Availability of support for WM EIS development, justification for planned action, willingness of public to accept planned action case

Appendix E - Process Logic Interactive Matrix

Process	Limiter	Solution	Dependent Upon
11. Transfer Facilities	1. NWTF startup 2. DB & PP Containment startup 3. F to H IAL startup 4. Operational utility 5. Timely WM EIS ROD	1. Complete startup program, tie-ins and operate facility 2. Complete construction, finalize startup plan, allocate resources and start up 3. Complete scope and estimate development; start up facility 4. Continue ongoing repairs and refurbishing activities 5. Justify and support planned action	1. TEC funding, successful readiness reviews 2. OPC funding requirements, TEC funding, type of startup 3. Priority; FY96 funding 4. Ability to preserve funding for repairs 5. Availability of support for WM EIS development, justification for planned action, willingness of public to accept planned action case
12. Consolidated Incinerator Facility (CIF)	1. Funding 2. Permitting Process 3. Startup Authorization 4. Secondary waste treatment or disposal 5. Timely DWPF SEIS ROD	1. Continue startup preps; use productivity improvements to fund emergent work 2. Continue current plan to start up based on pre-moratorium permits 3. Conduct thorough readiness reviews, resolve findings 4. Continue ashcrete and HW/MW Vault programs 5. Justify and support planned action	1. Funding, DOE and public support 2. Possible application of moratorium to CIF 3. Funding, extent of findings, willingness to support startup authorization 4. Agreement on scope/design of vaults, funding for vaults 5. Availability of support for SEIS development, justification for planned action, willingness of public to accept planned action case



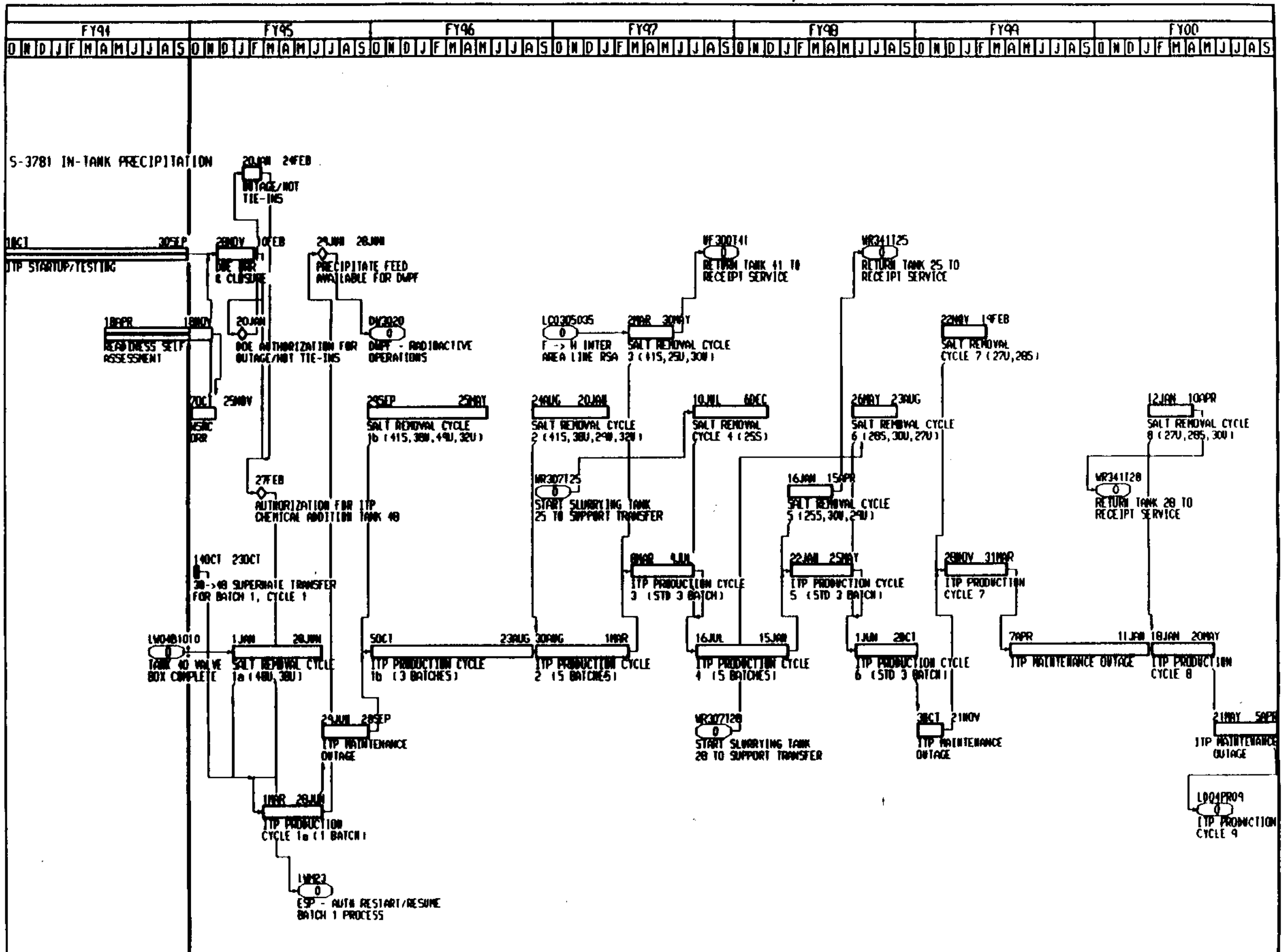
HIGH LEVEL WASTE DIVISION

HLW SYSTEM PLAN REVISION 4 (DRAFT)

1H, 2H & 2F EVAPORATORS

HLW CONTROLS MANAGEMENT

Date	Revision	Checked	Approved



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Data Date 1OCT94
Project Start 1OCT90
Project Finish 30NOV14

(c) Primavera Systems, Inc

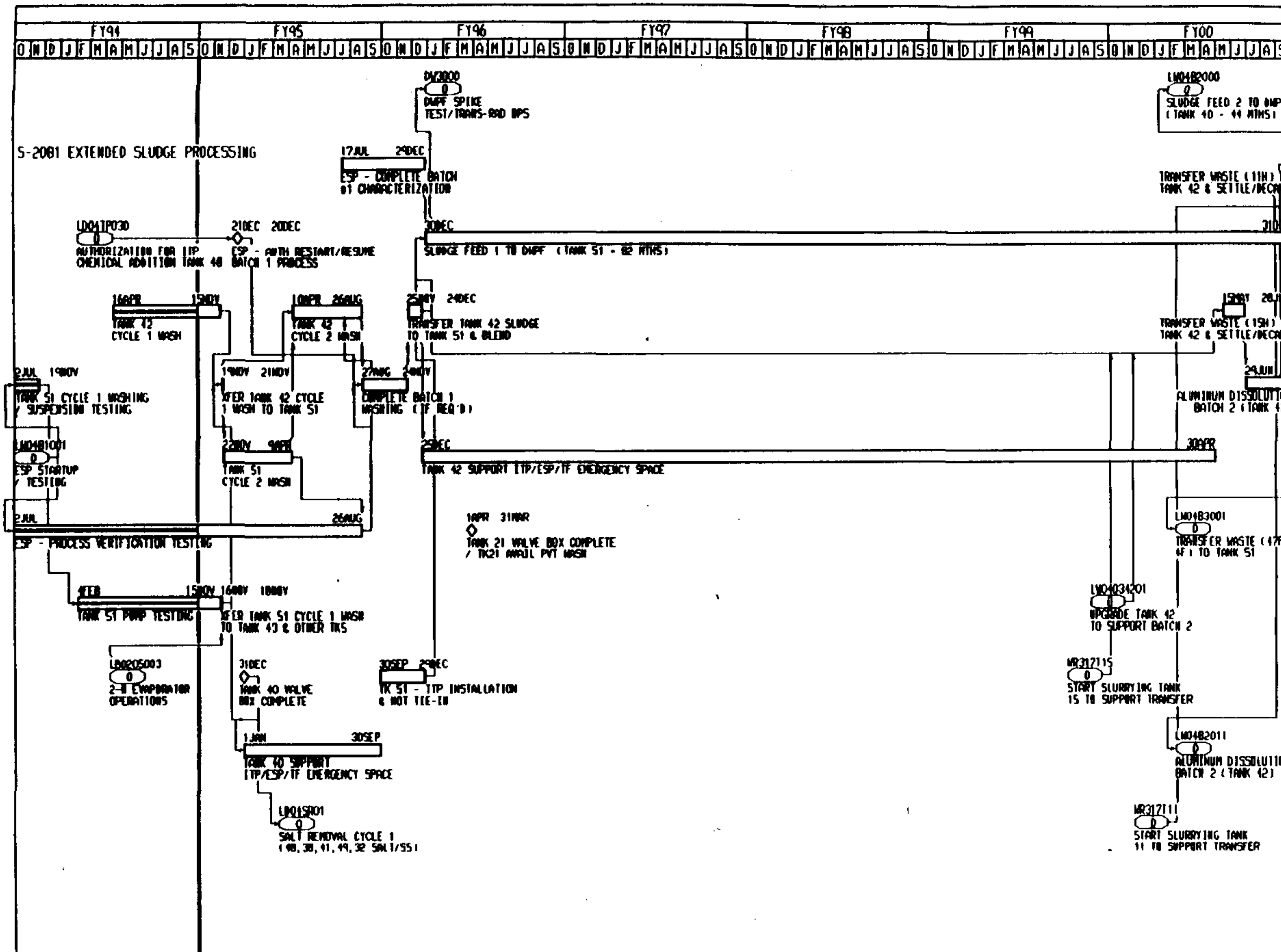
Activity Bar/Early Dates
Critical Activity
Progress Bar
Milestone/Flag Activity
Connecting Activity on Sheet

HIGH LEVEL WASTE DIVISION
HLW SYSTEM PLAN REVISION 4
IN-TANK PRECIPITATION

Sheet 1 of 1

HLW CONTROLS MANAGEMENT

Date	Revision	Checked	Approved



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Project Start 10CT90
Project Finish 1JAN20

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Milestone/Flag Activity
Connecting Activity on Sheet #

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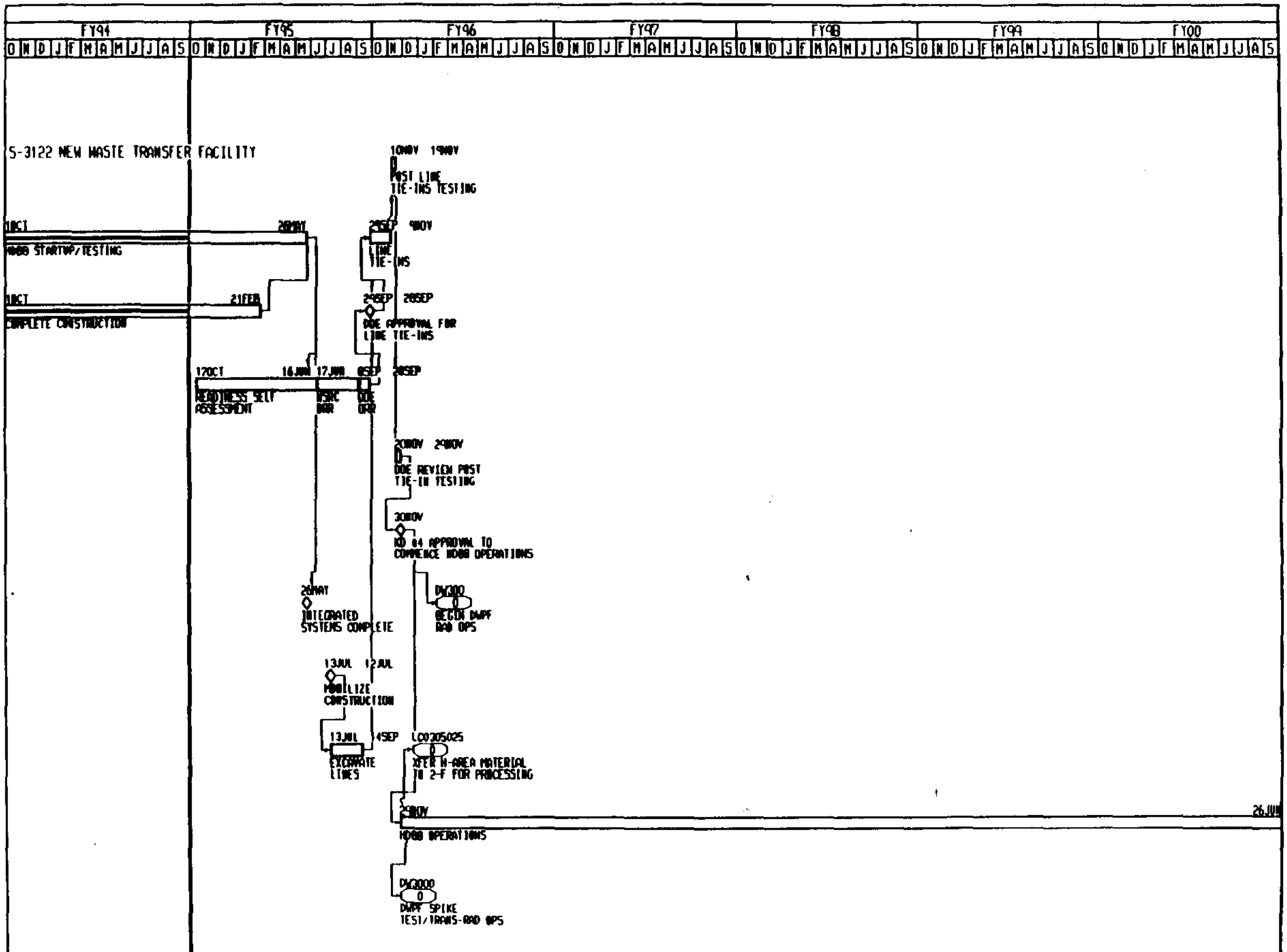
HIGH LEVEL WASTE DIVISION
HLW SYSTEM PLAN REVISION 4 (DRAFT)
EXTENDED SLUDGE PROCESSING

Sheet 1 of 1

HLW CONTROLS MANAGEMENT

Date	Revision	Checked	Approved



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Project Start
Project Finish

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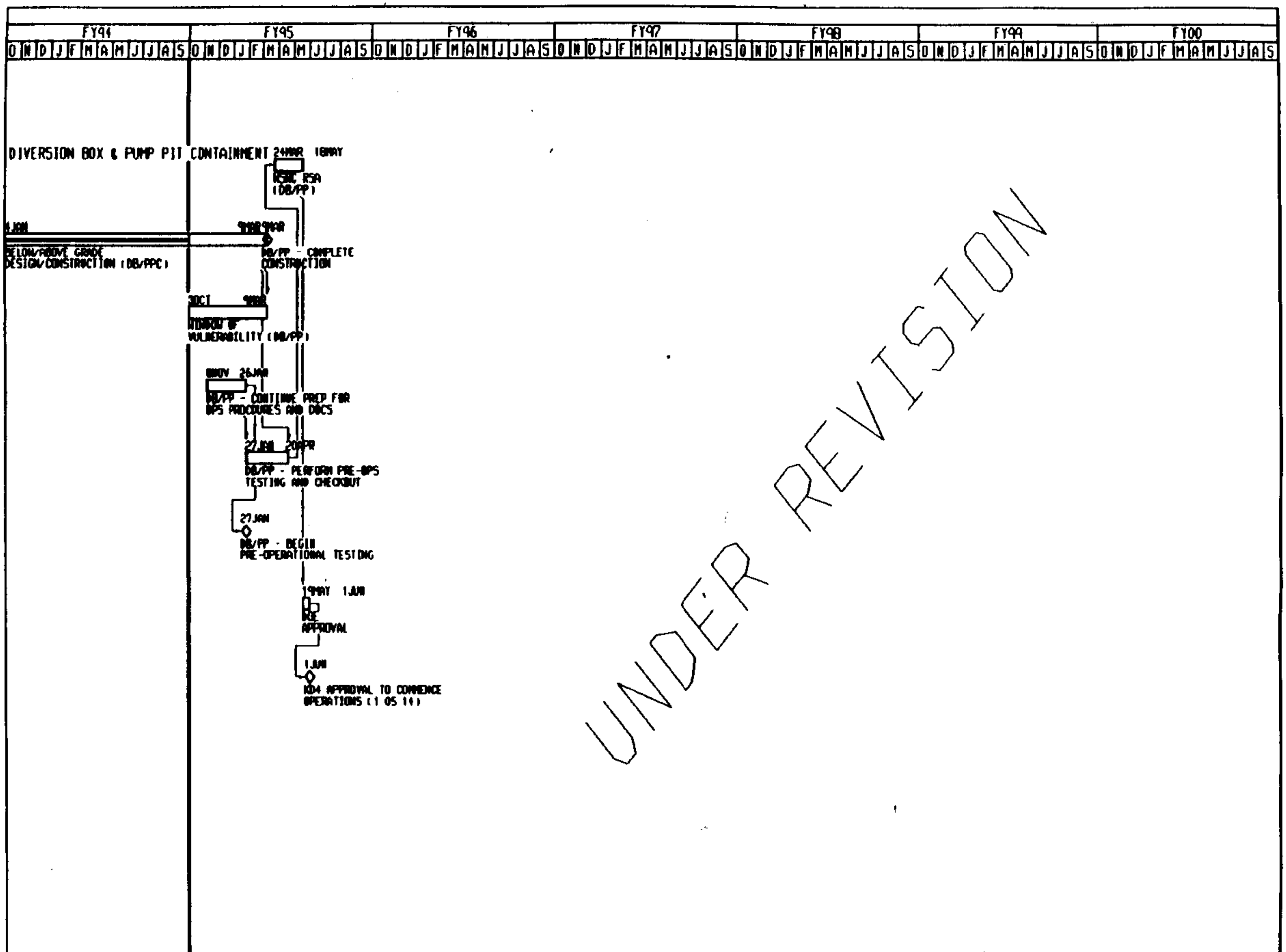
Connecting Activity on Sheet #

HIGH LEVEL WASTE DIVISION
HLW SYSTEM PLAN REVISION 4 (DRAFT)
NEW WASTE TRANSFER FACILITY

Sheet 1 of 1

HLW CONTROLS MANAGEMENT

Date	Revision	Checked	Approved



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Data Date
Project Start
Project Finish

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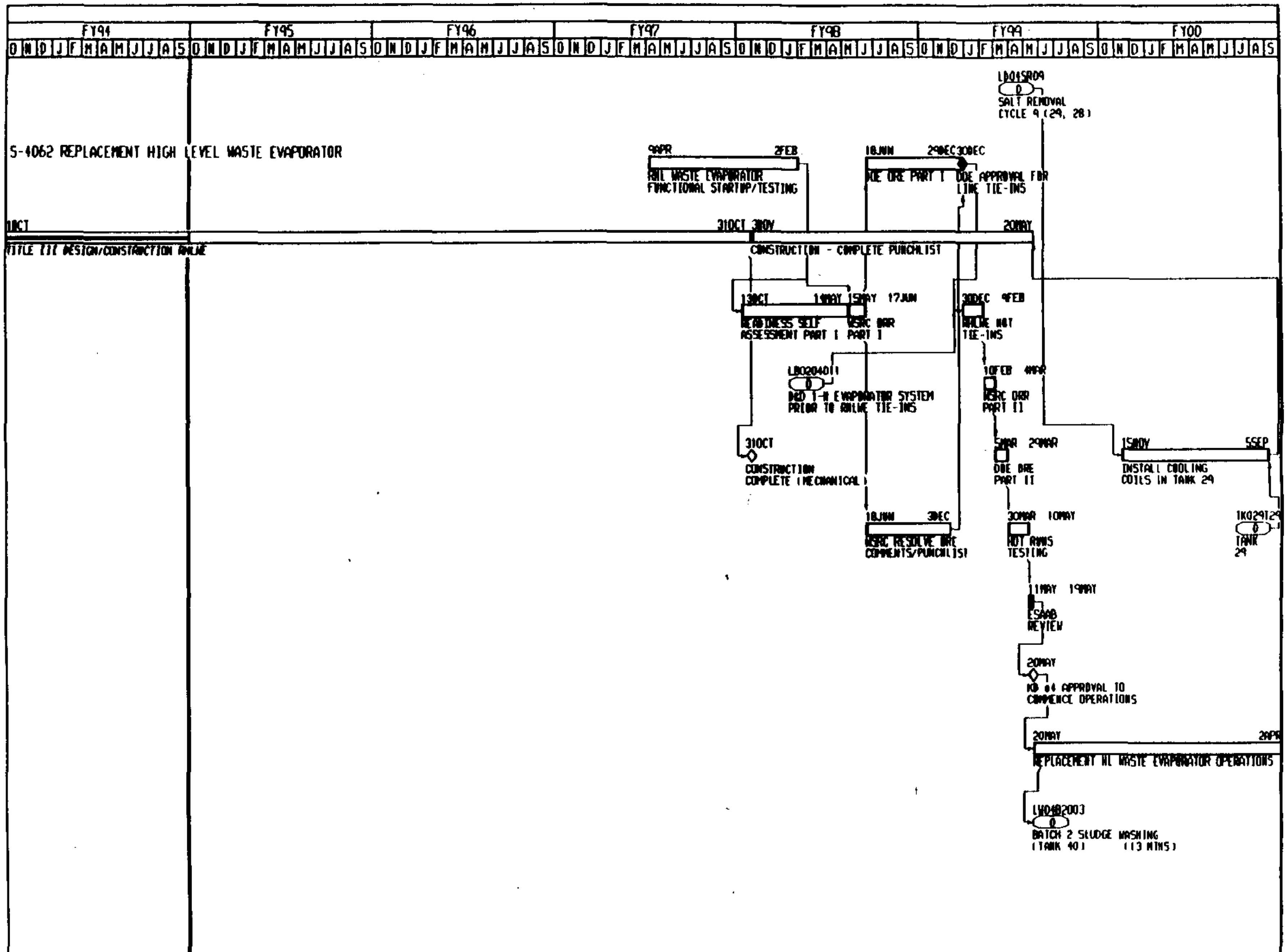
Sheet 1 of 1

HIGH LEVEL WASTE DIVISION
HLW SYSTEM PLAN REVISION 4 (DRAFT)
DIVERSION BOX & PUMP PIT CONTAINMENT

HLW CONTROLS MANAGEMENT

Date	Revision	Checked	Approved



Sheet 1 of 1

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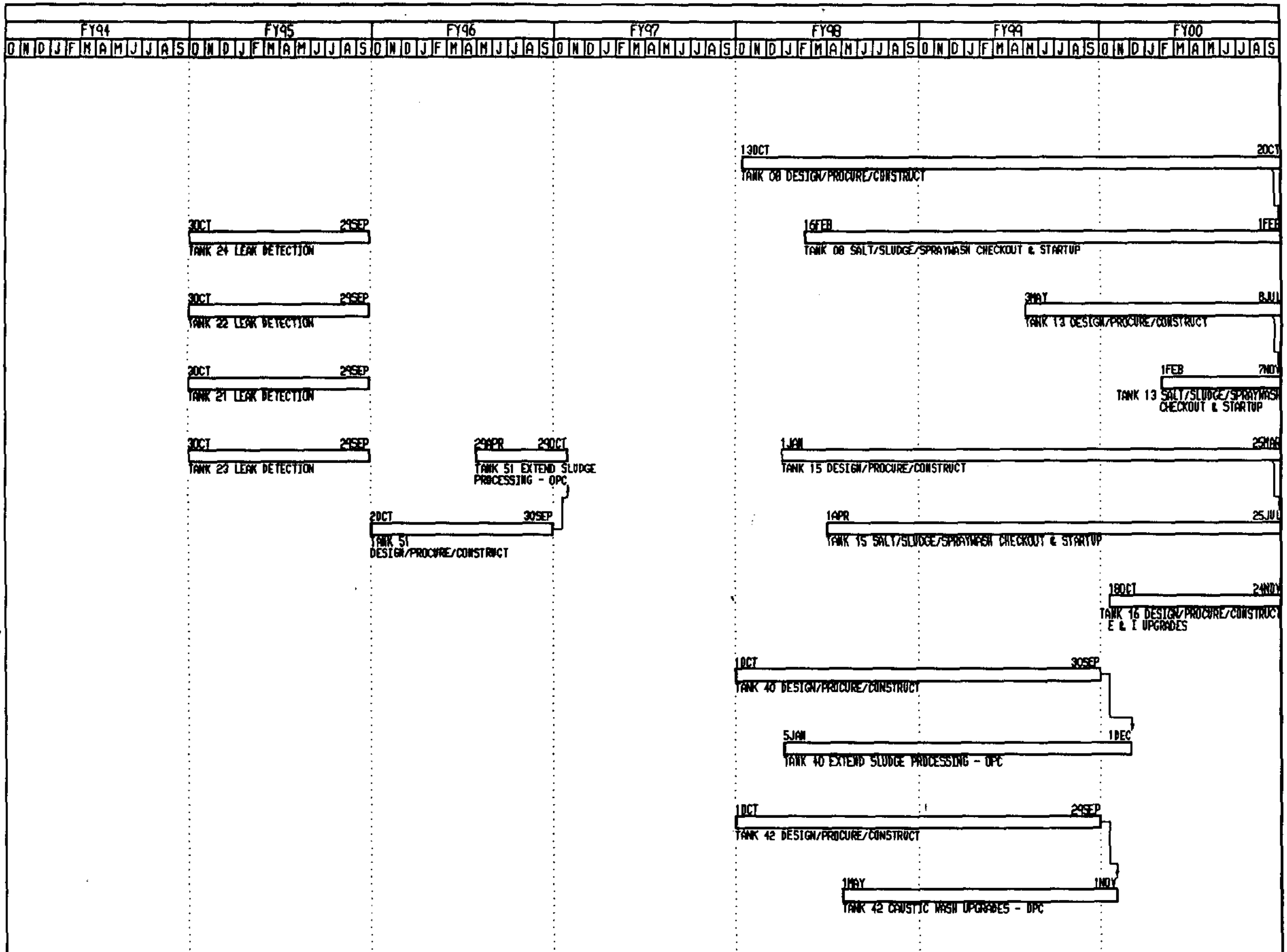
HIGH LEVEL WASTE DIVISION
HLW SYSTEM PLAN REVISION 4 (DRAFT)
REPLACEMENT HLW EVAPORATOR

Date	Revision	Checked	Approved



Plot Date
Data Date
Project Start
Project Finish

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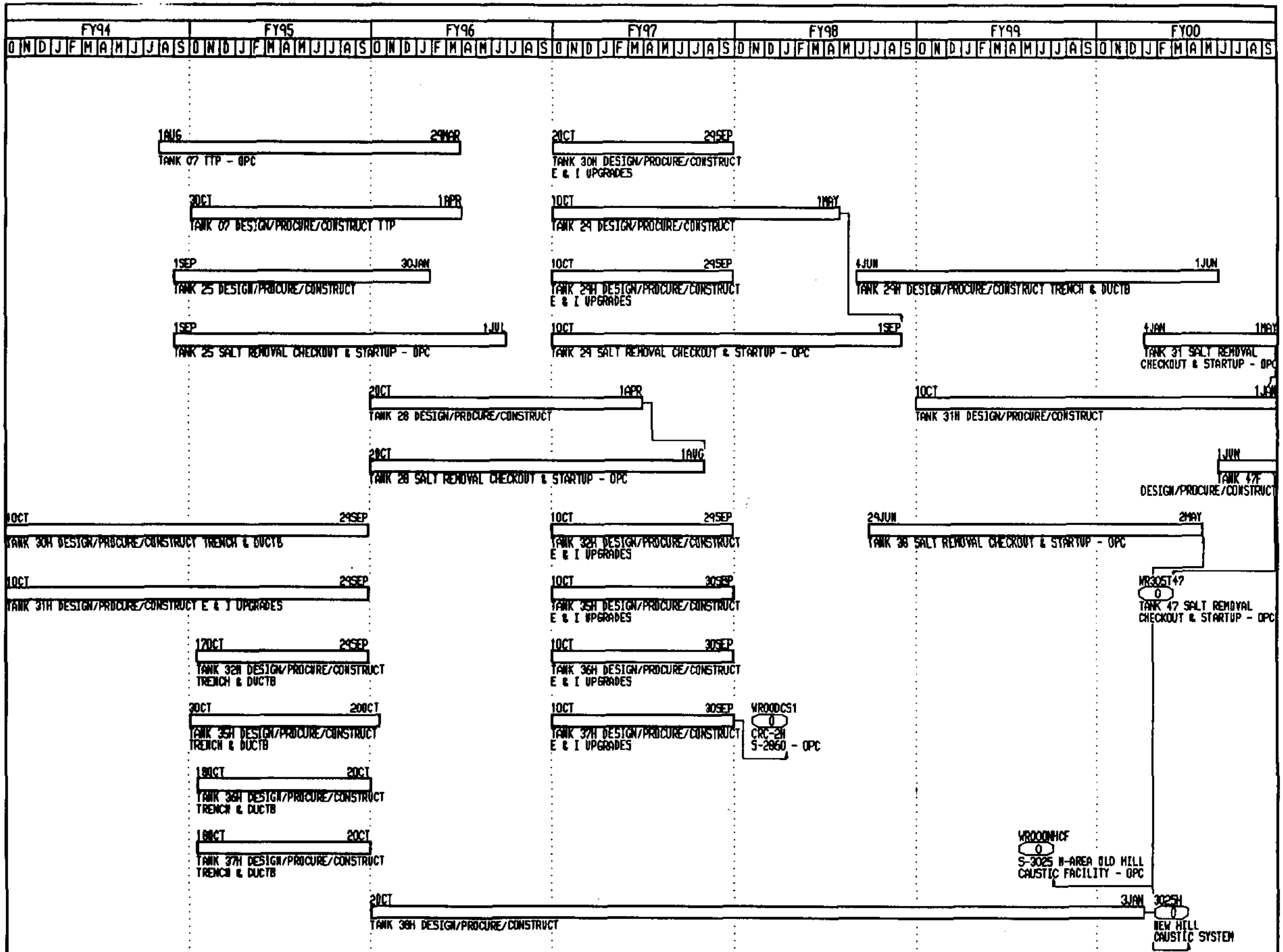
Activity Bar/Early Dates
Critical Activity
Progress Bar
Milestone/Flag Activity

HIGH LEVEL WASTE DIVISION
HLW SYSTEM PLAN REVISION 4
WASTE REMOVAL - SLUDGE TANKS

Sheet 1 of 1

HLW CONTROLS MANAGEMENT

Date	Revision	Checked	Approved



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Data Date 1OCT92
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Project Finish 21JAN11

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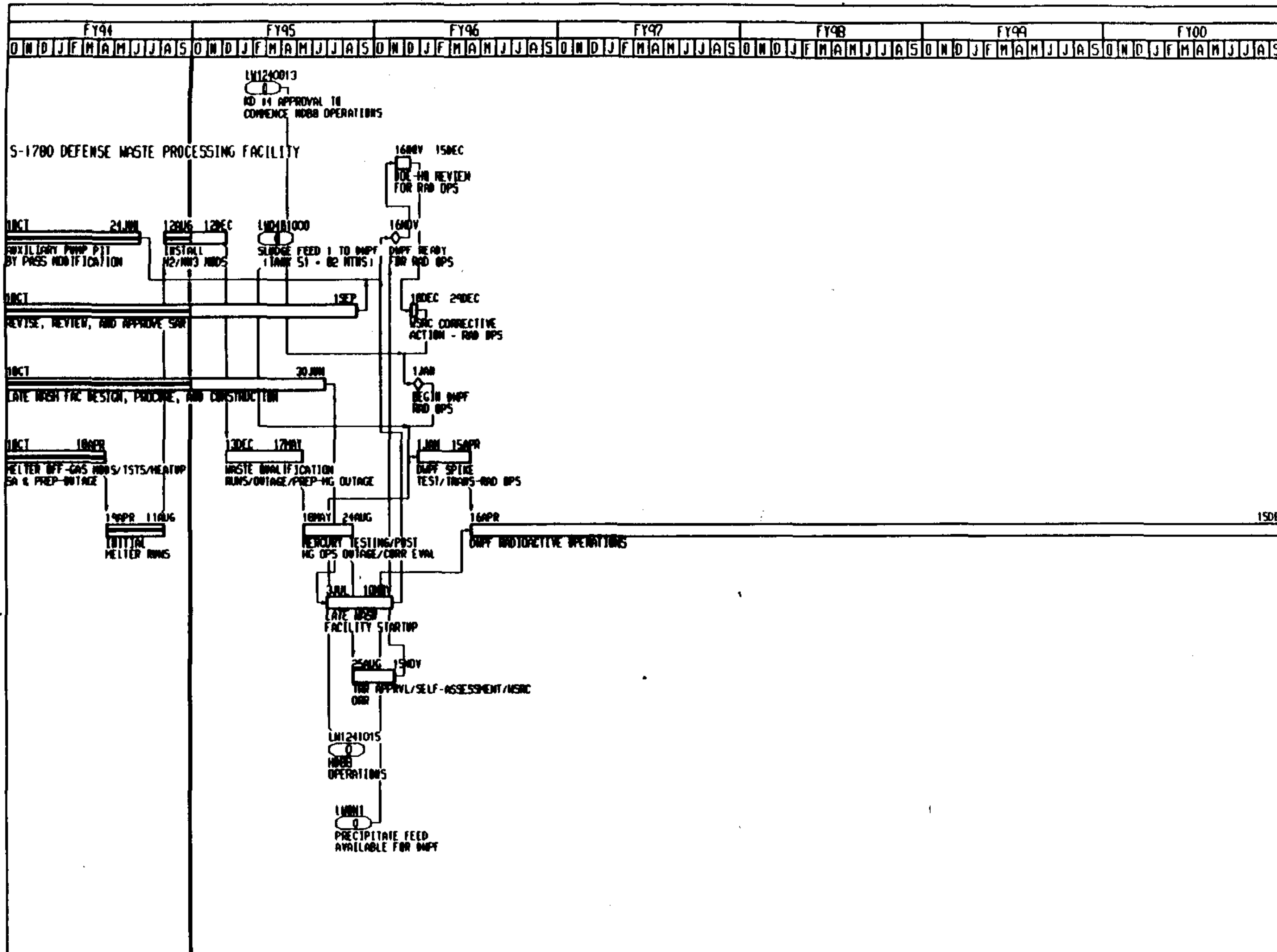
HIGH LEVEL WASTE DIVISION
HLW SYSTEM PLAN REVISION 4
WASTE REMOVAL - SALT TANKS

Sheet 1 of 1

HLW CONTROLS MANAGEMENT			
Date	Revision	Checked	Approved



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Progress Bar
Milestone/Flag Activity
Connecting Activity on Sheet #

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HIGH LEVEL WASTE DIVISION
HLW SYSTEM PLAN REVISION 4 (DRAFT)
VITRIFICATION - DWPF

Sheet 1 of 1

HLW CONTROLS MANAGEMENT

Date	Revision	Checked	Approved

Appendix G.1 - Programmatic Uncertainties

Issue	Assumption	Contingency/Action
• Integrated HLW System Schedule has no schedule contingency for emergent program requirements or emergent hardware-related work	• The schedule is success driven and problems will be dispositioned in a way so as not delay the schedule.	• Review each facility and quantitatively assign contingency based upon a recognized method. • Jointly agree to accept schedule risk where there is no contingency.
• Manpower levels have been constrained and do not fully integrate with the manpower requirements to match the program/project scope and budget as defined in the AOP.	• Vacancies in high priority programs will be filled by existing HLW division personnel.	• Overtime will be used to complete work on schedule.
• Funding, manpower allocation and processing uncertainties may impact the Site's ability to meet Waste Removal commitments as identified in the AOP and FYP.	• Near-term funding and allocation of personnel will support the WR program as defined in the AOP and this System Plan. • Innovation in systems integration and production planning can help overcome processing uncertainties.	• Examine current budget allocations to identify possible sources of funding for near-term waste removal expenses. • Continue development and application of systems integration tools.
• System-wide impacts of recent reductions to Waste Removal Program funding need to be fully evaluated.	• The impact of funding changes must be incorporated into current HLW system planning bases. Funding revisions will impact overall attainment without impacting process flowsheet integrity.	• Initial review of program impacts support the need to maintain as much funding as possible for the WR Program.
• The Inter-Area Transfer Line and associated controls/support systems must be upgraded before transfers can be made from F-Tank Farm to H-Tank Farm.	• The IAL upgrade project will be appropriately manned and funded so that transfers can be made in support of the waste removal program.	• Identify and allocate resources to support this project.
• SRS's proposed FFA waste removal schedule has not been formally accepted by the regulator.	• The regulator will accept FFA commitments for waste removal activities, without commitments for interim waste processing milestones.	• Negotiate with Regulator a strategy where firm commitments are made for the budget year and forecasts thereafter. • Negotiate a schedule where there is increasing contingency each year after the current budget year. • Provide candid updates to the Regulators via quarterly meetings.

Appendix G.1 - Programmatic Uncertainties

Issue	Assumption	Contingency/Action
• FFA Regulators may require interim waste processing milestones as precursors to proposed waste removal commitments.	• The Regulators will accept FFA commitments for waste removal activities, without commitments for interim waste processing milestones.	• Negotiate with Regulator a strategy where firm commitments are made for the budget year and forecasts thereafter. • Negotiate a schedule where there is increasing contingency each year after the current budget year. • Provide candid updates to the Regulators via quarterly meetings.
• Plan for relocation of Tank 41 controls to the 2H Evaporator Control Room and Tank 41 hardware-related work to return Tank 41 to salt service not complete.	• A plan will be implemented prior to feeding the second tank to ITP	• Continue existing engineering study, determine funding source, implement. • HLW System Integration Manager will track issue through to implementation. • Evaluate extending life of Tank 38 by direct feeding concentrated supernate to ITP from Tanks 38 and 43. • Form salt in Tank 40.
• The Site may not be able to handle the increased analytical requirements resulting from the startup of ITP, ESP, DWPF, and Late Wash.	•Shortfalls, if any, can be identified and corrected without delaying key schedules.	• Complete site studies regarding need for new laboratories, consolidating existing labs, restart of the 772-F lab, etc.
• ITP processing rates are uncertain because the facility has never operated.	• ITP will start up 3/95 and will be able to achieve their planned production rate.	• ITP Production Planning has been refined for the first three production cycles. More detailed, outyear planning efforts are underway.
• Disposal of the CIF secondary aqueous waste stream is not fully developed.	• The stream can be solidified in the CIF's ashcrete system.	• A Baseline Change Proposal (BCP) to solidify the aqueous wastes in the ashcrete system has been submitted to DOE for approval. • A vendor could be hired if necessary.
• The CIF is needed in the 1999 time frame to treat DWPF benzene. The CIF may be delayed by the Waste Management EIS now in progress.	• Successfully managing the project and schedule will make it less vulnerable to delays or cancellation.	• There is approximately 5 years of float between the CIF's scheduled 1/96 startup and the date when the CIF is required to support the DWPF (assuming 35% initial attainment for DWPF).

Appendix G.1 - Programmatic Uncertainties

Issue	Assumption	Contingency/Action
• Approval of the CIF SAR could be delayed, (consequently delaying development of CIF operating procedures, Operating Safety Requirements, Process Requirements, etc.) if DOE approval of the Site Generic SAR is delayed.	• DOE approval of the Site Generic SAR will occur in a timeframe that supports CIF SAR approval.	• Personnel supporting the development of the CIF SAR are working closely with DOE to ease SAR review concerns.
• After the Canyons shut down, there will be no 211-F facility to evaporate miscellaneous waste if DP does not provide support. This combined stream to the Tank Farm could be 940,000 gallons/year.	• The Canyons can continue to run their evaporators until the RHLWE starts up. • A process at 211-F will be implemented to volume reduce this stream before it gets to the Tank Farm.	• Canyon personnel have stated that they can operate their evaporator after the 1997-98 time frame if needed. This needs to be formally agreed upon by affected parties. • Implement a volume reduction process at 211-F.
• Safety classification of equipment will affect DWPF program cost and may affect schedule.	• There will be no impact to DWPF schedule.	• The DWPF schedule may be delayed, and additional funds will be needed. • DWPF personnel are pursuing a "Plan to Address Outstanding Technical Safety Issues for the DWPF," which will define the cost and schedule impact of safety class modifications.
• The outcomes of the DWPF SEIS and the WM EIS could impact the construction schedule or planned operation of HLW facilities.	• Development of the DWPF SEIS and the WM EIS will proceed in parallel with current HLW activities and thus not impact current plans. • Both the DWPF SEIS ROD and the WM EIS ROD will be issued in a timely manner, and they will support the Proposed Actions identified for each SEIS/EIS.	• High priority is being placed on timely development of the DWPF SEIS and the WM EIS documents.
• Compliance requirements and schedules for the 90-2 program are not defined. The 90-2 Program is funded for DWPF, but unfunded for the rest of HLW.	• Facility startup schedules will not be adversely impacted by non-compliances identified in the 90-2 program.	• Compliance assessments are being conducted and documented. • A report will be sent to DOE describing all non-compliances identified during DWPF's administrative assessments. DOE is expected to respond by establishing priorities for compliance.
• System-wide impacts of recent changes to the RHLWE schedule have not been fully evaluated yet.	• Waste processing and evaporation can continue without adverse impacts.	• Evaporation logistics or waste processing rates will be adjusted if necessary.

Appendix G.1 - Programmatic Uncertainties

Issue	Assumption	Contingency/Action
• Valuable resources have been diverted away from the ESP Slurry Pump Program to support higher priorities; any ESP delays could impact the timely availability of Sludge Batch #1.	• ESP Slurry Pump Program needs can be resolved in a timely manner.	• Complete sludge processing but cease slurrying activities, thereby stopping inadvertent water addition from leaking pumps. • Replace Tank 51's pump B1.
• SRS's downsizing efforts could compromise work force quality and leave the Site with the wrong skill mix.	• Adequate training can be provided to maintain a competent work force.	• Specific critical positions can be filled via the site Critical Needs Staffing Program.
• HLW technology needs may have to compete with SRTC's commitment to technology transfer programs and work for others.	• SRTC resources can be adequately allocated to support HLW needs.	• HLW managers will continue to work closely with their SRTC counterparts to establish fair work priorities.
• As more new HLW facilities approach the start of radioactive operations, the frequency and intensity of external reviews will increase significantly.	• External reviews will be scheduled and managed to the benefit of the HLW system.	• HLW personnel will continue to build credibility with external reviewers by maintaining active and open relationships with them.
• Tank 19, like Tank 20, has had groundwater unexpectedly leak into the tank from the side wall. The condition of Type IV Tanks could be suspect.	• The condition of Type IV Tanks in H-Area is sound and these tanks can be used for 30 more years. There will be no leaks in Tanks 21-24.	• Replace Tanks 21-24 with new tanks. Redeploy Type III Tanks to provide the service of Tanks 21-24 if possible.
• The F-Area encasement has collapsed in one place and is leaking in several others.	• This collapse will not propogate into a massive problem in F-Area. The H-Area encasement will not fail similar to F-Area.	• Refurbish encasements. Install new jacketed piping to replace the encasements.
• Funding reductions result in the extended service of aging facilities.	• Waste tanks and other facilities that were designed for a 30 year service life can be maintained to last for 90 + years.	• Restore funding cuts to accelerate program. Obtain emergency appropriations to restore program. Move waste from leaking tanks into empty tanks if possible.

Appendix G.2 - Technical Uncertainties

Issue	Assumption	Contingency/Action
• The capability to dispose of the DWPF mercury runs recycle stream is not fully implemented yet.	• Mercury recycle stream can be treated at DWPF and trucked to the F/H ETF.	• Continue ongoing studies to evaluate. • Maintain NWTF schedule in support of pumping Hg Recycle to Tank Farm if needed. • Maintain trucking Hg Recycle to NWTF or Tank 47 as an option.
• Tank 41 criticality concerns may delay salt removal from Tank 41 and thus impact the 2H Evaporator operation.	• Rigorous sampling of Tank 41 will enable salt removal to proceed as planned.	• Continue salt sampling program to get samples from deeper in the tank. • Feed concentrated supernate to ITP as needed to provide evaporator salt space and ITP feed, accept negative impacts. • If all else fails, investigate using Tank 40 for salt receipt, accept negative impacts.
• HLW tank temperature rise due to slurry pump operation not known and could reduce planned production rates	• Temperature can be controlled in a way that does not significantly reduce production.	• Complete the ESP PVT, generate data, evaluate and make recommendations. • Continue Tank Farm Services Upgrades project planning and support as needed.
• ITP ability to withstand seismic event not known, geotechnical studies may identify corrective actions that would delay startup.	• Ongoing seismic/geotechnical studies will not identify any unplanned work that will delay ITP startup.	• Complete the seismic/geotechnical study currently in progress, evaluate data, recommend fixes if any, implement on fast track schedule.
• Final feed specs for DWPF sludge-only feed and future sludge and precipitate feed not finalized, some waste may not be able to be processed.	• There are adequate planning tools to enable all waste to be planned for and processed in a manner defensible to outside agencies. • CPES/PCCS modeling indicates all six batches can be processed.	• Complete the Integrated HLW Flowsheet Model by 12/30/94, use the Model to optimize waste removal activities, and plan all batches until the end of the sludge removal campaign.
• There are some Canyon waste streams for which there is no disposal plan such as Am/Cm and Np. Future disposal of these streams to the Tank Farm could impact other downstream processes.	• The risk is small. • All streams will be dispositioned.	• Each stream will be handled separately using a USQD and Technical Evaluation. • Problematic radionuclides and chemicals, if any, could be diluted with other waste.

Appendix G.2 - Technical Uncertainties

Issue	Assumption	Contingency/Action
• Formalized production plans for ITP and ESP have not been completed. The processing rates have been effected by temperature concerns, criticality and other process changes. Schedules and planning for other facilities could be effected.	• Adequate contingency has been applied to the now obsolete ITP/ESP flowsheets to accommodate process changes. PVT results will be included in production plans.	• Facility flowsheets have been rebaselined. Production plans have been generated for the first three ITP cycles. Production planning will continue for subsequent cycles. • The CPES process model has been run for all six sludge batches, using average salt composition; acceptable waste chemistry was verified. Subsequent CPES runs will model the six sludge batches with individual salt tank compositions.
• ESP pump seal leaks are adding undesired amounts of water to ESP Sludge Batch #1.	• Water already added will not affect Batch #1 processing. Problem can be resolved without impacting subsequent processing schedules.	• Delay ESP Batch #1 washing until the excessive leakage problem is corrected. • Complete as much of the ESP PVT as possible, then fix the leakage problem, then complete Batch #1 washing.
• Durametallic bottom seals in Tank 51 pumps add too much water to maintain long term characterization of sludge batches	• Corrective actions can be taken with existing seals, or • The Burgmann bottom seals or some other seal will be identified as a long term solution. All pumps will be refitted without effecting key System milestones.	• Develop a seal-less pump or pump with acceptable leak rate. • Delay DWPF startup until the excessive leakage problem is corrected.
• The Waste Removal program scope is limited to water washing the tank interior and annulus for each old-style tank to be retired. Additional cleaning, possibly chemical cleaning, may be required prior to turning the tank over to the ERWM Division.	• Water washing will be adequate. If further cleaning is required, then an ERWM cost funded project will provide the facilities and operations.	• Chemical cleaning has been successfully demonstrated using dilute oxalic acid in Tank 16. This process may be applicable to other sludge tanks.

Appendix G.2 - Technical Uncertainties

Issue	Assumption	Contingency/Action
• The precipitate inventory in Tank 49 is limited to 565,000 gallons based on an average precipitate concentration of 39 Ci/gal. HLW System attainment is restricted by this limit.	• Actions will be identified and implemented to enable the Tank 49 level to return to the original OSR, or, the long term Tank 49 limit of 565 kgal is acceptable.	• Operate the HLW System at reduced attainment during the periods of high precipitate generation. • Make necessary hardware and documentation changes to enable tank 49 limit to be raised.
• Initial salt samples from Tank 41 indicate that chromium levels in the dissolved salt will exceed the DWPF glass limit and insoluble solids will exceed the Tank 48 process requirement.	• Insoluble solids and chromium in Tank 41 dissolved salt will be less than expected or will be allowed to settle prior to feed to ITP.	• Use Tank 40 for 2H salt receipt. • Revise the HLW System waste removal plans accordingly, if necessary.
• Resolution of safety class issues, particularly modifications to the DWPF Vitrification Building and Late Wash Auxiliary Pump Pit, are not clearly defined.	• Modifications can be completed without delaying DWPF or Late Wash startup and within existing project estimates.	• Studies to define requirements will be completed in FY94. Scope and schedule of modifications will be developed. There is some project cost and schedule contingency.
• The H-Area New Hill is settling. Some transfer lines have settled several inches and may not have the proper slope.	• Settlement has not damaged the lines, and the lines do not have to excavated and resloped. • If excavation and resloping is necessary, it can be done without affecting key schedules and milestones.	• Additional funds could be made available via cost efficiencies or scope reductions to other programs. • Startup schedules could be slowed down.
• F-Area pump tanks do not have agitators installed. Insoluble solids are probably collecting in the tanks. Pump rates may be effected or pump pluggage may occur.	• The condition will not worsen. • Agitators can be installed as needed without affecting key schedules and milestones.	• Agitators are available for pump tanks 2 and 3. FPP-1 used to have an agitator, but now has a second transfer pump that is normally used in a recirc mode to provide some agitation. The old agitator could be installed and a tank transfer jet could be used to transfer supernate.

Appendix G.2 - Technical Uncertainties

Issue	Assumption	Contingency/Action
• Ultimate disposition for DWPF's elemental mercury stream has not been finalized.	• Appropriate arrangements can be made for resale of the mercury to industry.	• HLWMD personnel have contacted Oak Ridge and DOE-HQ for guidance on the regulatory process for decontamination and resale of the mercury.
• Seismic studies currently confined to ITP will propogate into the Tank Farm. Remediation may be required.	• The Tank Farms can continue to operate. Remediation, if necessary, will not effect other key milestones.	• Obtain additional funding if remediation is necessary. Delay other milestones to accomodate remediation if necessary.

Appendix H - DOE Milestones

ADS	Title	Due
21-AA	DWPF Program Management	
	• Complete Transition to RW-0333P QA Program	12/13/94
22-AA	DWPF Vitrification	
	• Complete and Document Purex Sludge (PX-6) Campaign Results	11/15/94
	• Issue the final BCP's for the DWPF Safety Basis Upgrades	12/15/94
	• Issue DWPF Supplemental Environmental Impact Statement and Associated Record of Decision	12/18/94
	• Ready for waste acceptance testing	12/19/94
	• Complete TNX testing and documentation of Ammonia Scrubber performance	1/6/95
	• Commence Readiness Self Assessment	1/31/95
	• Issue interim reports for WP-14 Waste Qualification Runs	5/5/95
	• Complete ALARA activities for Mercury Runs	5/25/95
	• WSRC Ready for Mercury Runs	5/25/95
	• Submit Waste Certification Plan for approval	5/31/95
	• Submit Safety Analysis Report to DOE	7/5/95
	• Submit 24 System Design Description Documents for review and approval	7/29/95
	• Issue interim reports for WP-15 Waste Qualification Runs	8/15/95
	• Review and approve the Configuration Management Plan	8/30/95
	• Complete welder demonstrations	8/31/95
	• Complete radioactive operations training	9/4/95
	• Complete Phase II SCD-4 baseline assessment	9/29/95
	• Ready for Waste Certification Assessment	9/29/95
	• Submit 110 Vendor Manuals for approval	9/29/95
	• Submit 25 System Master Equipment Lists for review and approval	9/29/95
	• Submit Functional Performance Requirements for Failed Equipment Storage Vaults 3-6	9/29/95
	• Start of DWPF Radioactive Operations	12/95

Appendix H - DOE Milestones

ADS	Title	Due
23-AA	Z-Area Saltstone	
	• Ready for Waste Certification Assessment	10/31/94
	• Process 1.5 million gallons	9/29/95
26-LI	DWPF Line Item	
	• Pour the first concrete for the new Late Wash building foundation	10/10/94
	• Complete Failed Equipment Storage Vaults 1 & 2	12/15/94
	• Complete Glass Waste Storage Building Plug rework	3/3/95
	• Complete Entry Control Facility	5/1/95
	• Initiate Late Wash Lab Foundation	5/20/95
	• Complete Late Wash Title II design	8/9/95
	• Start Radioactive Operations	6/96
31-AA	HLW Program Management	
	• Issue Linking Document for Tank Farms	10/7/94
	• Transmit Revision 4 of the HLW System Plan	11/30/94
	• Issue H and F Tank Farm Steam Manuals	12/20/94
	• Implement Facility Condition Inspection Program	12/30/94
	• Issue Revision 1 of HLW System Process Interface Document (PID)	1/30/95
	• Revise and Issue System Integration Management Plan	1/31/95
	• Complete waste certification of all waste streams going to Solid Waste facilities	3/1/95
	• Issue Work Package Priority Assignment Decision Procedure	3/30/95
	• Issue Revision 1 of HLW Waste Acceptance Criteria (WAC) and provide example WAC Compliance Plan to waste generators	3/31/95
	• Issue F and F Utility Manuals	4/1/95
	• Issue WSRC approved Basis for Interim Operation	4/30/95

Appendix H - DOE Milestones

ADS	Title	Due
	• Issue WSRC approved Technical Safety Requirements	7/15/95
	• Complete operator, maintenance, and technical support training to support hot tie-in of the New Waste Transfer Facility	9/29/95
	• Run HLW Integrated Flowsheet Model to completion of waste removal	9/29/95
32-AA	H-Tank Farm	
	• Complete the layup of the 1H Evaporator System. Date to be determined by 10/30/94 after Revision 4 of the System Plan is complete.	
	• Develop Essential Document List	4/30/95
	• Initiate the 2H Evaporator pot replacement outage.	5/1/95
	• Resolve P&ID discrepancies for 12 systems	5/15/95
	• Recover 600,000 gallons of tank space based on evaporation and CRC operation. (Assumes availability of feed)	9/29/95
33-AA	F-Tank Farm	
	• Develop a plan of action to upgrade the F to H Inter-Area Line	1/30/95
	• Develop Essential Document List	4/30/95
	• Resolve P&ID discrepancies for 12 systems	5/15/95
	• Recover 400,000 gallons of tank space based on evaporation. (Assumes availability of feed)	9/29/95
34-AA	ITP / ESP	
	• Complete all maintenance personnel qualification activities to support startup of the In-Tank Precipitation facility	10/30/94
	• Issue final Status Report for Confinement Assessment Program	11/15/94
	• Achieve 130,000 gallons of space gain by feeding Tank 38 concentrated supernate to ITP	12/1/94

Appendix H - DOE Milestones

ADS	Title	Due
	• Complete preparations for Tank 40 to stage salt solution	12/1/94
	• Complete Hot Tie-ins and request authorization for Chemical Additions which will initiate radioactive operation	12/15/94
	• Complete documentation of ITP filter cleaning cycle demonstration	12/20/94
	• DOE authorization to initiate full radioactive operations of the ITP Facility	12/29/94
	• Initiate salt dissolution in Tank 41	1/6/95
	• Complete ESP Process Verification Test	5/31/95
	• Close out ITP Cost Project	6/15/95
	• Complete ESP Batch #1 washing in Tanks 42 and 51	7/1/95
	• Complete sludge suspension testing in Tank 42	7/1/95
	• Complete ESP Batch #1 consolidation into Tank 51	8/30/95
	• Complete three process batches at ITP	9/25/95
	• Sludge Batch #2 ready to feed	8/02
	• Sludge Batch #3 ready to feed	7/06
35-AA	Effluent Treatment Facility	
	• Complete Organic Removal Cleaning System Project	9/29/95
38-LI	HLW New Facility Planning	
	• Complete the Conceptual Design Report for the Sampling / Monitoring System Upgrade project 6 months after new start approval (KD #0) is received	
	• Complete Benzene Abatement Pre-conceptual study	12/15/94
39-LI	New Waste Transfer Facility	
	• Complete NWTF construction activities excluding tie-ins	4/1/95
	• Complete NWTF component and system testing	6/30/95
	• Initiate the NWTF WSRC ORR	7/15/95

Appendix H - DOE Milestones

ADS	Title	Due
	• Initiate the NWTF DOE ORR	9/1/95
	• Complete Tank Operator qualification for H/F Tank Farm Operators in incumbent upgrade training program	9/29/95
	• Initiate NWTF tie-ins	9/29/95
	• Start of Radioactive Operations	11/95
310-LI	Replacement HLW Evaporator	
	• Complete enclosure of the RHLWE building - siding and roof. (Date to be provided by 10/1/94)	
	• Complete planned RHLWE TEC shutdown activities. (Date to be provided by 10/1/94)	
	• Start Radioactive Operations	~5/01
311-LI	Diversion Box & Pump Pit Containment	
	• Complete construction of Diversion Box and Pump Pit Containment Project	9/29/95
314-LI	HLW Removal from Filled Waste Tanks	
	• Re-sequence waste removal work activities based on revision of the System Plan	10/30/94
	• Complete 2H Control Room DCS Factory Acceptance Testing - (OPC)	5/30/95
	• Complete and turnover the 242-H Control Room building - (TEC)	7/31/95
	• Complete Tank 7F Telescoping Transfer Pump support upgrades - (TEC)	9/29/95

Notes:
c = complete
n = need date, no current supporting schedule
tbd = to be determined

Appendix I - Summary of Waste Receipts

Year	F-LHW	F-HHW	H-LHW	H-HHW	RBOF	299-H	Trailers	ETF
1954	35,312	35,710	0	0	0	0	0	0
1955	790,681	984,200	244,918	650,400	0	0	0	0
1956	411,019	487,352	430,200	839,610	0	0	0	0
1957	72,450	85,730	415,471	497,270	0	0	0	0
1958	0	0	231,900	298,000	0	0	0	0
1959	501,939	485,102	47,238	941,963	0	0	0	0
1960	1,279,014	808,004	2,923	402,173	0	0	12,000	0
1961	993,765	3,217,965	9,947	475,422	0	0	3,000	0
1962	1,432,980	615,407	6,576	733,456	0	0	2,000	0
1963	1,227,702	688,965	199,462	540,521	79,000	0	45,300	0
1964	1,391,284	803,040	199,532	440,734	1,260,802	0	14,500	0
1965	485,954	727,401	438,320	942,297	590,134	0	116,050	0
1966	776,029	258,063	550,880	1,243,328	1,494,300	0	11,200	0
1967	747,113	274,016	551,282	897,197	1,632,978	0	13,300	0
1968	688,240	231,262	727,481	721,376	1,612,828	0	180,900	0
1969	930,389	260,835	752,401	864,951	1,187,000	0	360,700	0
1970	862,795	192,938	769,549	814,794	2,261,500	0	220,200	0
1971	671,327	234,343	708,166	994,926	2,295,000	0	1,400	0
1972	929,256	214,344	841,294	813,327	1,724,000	0	38,000	0
1973	1,089,842	322,290	921,378	893,976	1,768,000	0	38,600	0
1974	814,768	182,416	788,090	623,887	970,000	0	0	0
1975	527,736	72,477	350,381	542,966	1,349,000	0	3,000	0
1976	906,700	127,000	549,000	444,000	1,264,000	0	63,300	0
1977	756,500	69,000	455,000	486,000	647,000	0	28,500	0
1978	804,000	129,000	496,000	419,000	624,000	0	29,000	0
1979	798,000	187,000	575,000	511,000	716,000	0	41,000	0

Appendix I - Summary of Waste Receipts

Year	F-LHW	F-HHW	H-LHW	H-HHW	RBOF	299-H	Trailers	ETF
1980	1,131,000	216,000	642,000	554,000	644,000	0	8,000	0
1981	1,323,000	271,000	392,000	574,000	442,000	0	5,000	0
1982	1,093,000	279,000	425,000	380,000	45,000	0	7,000	0
1983	1,684,000	297,000	508,000	427,000	853,000	0	86,000	0
1984	2,122,000	419,000	532,000	513,000	1,293,000	0	98,000	0
1985	2,146,000	580,000	441,000	601,000	991,000	34,000	25,000	0
1986	1,381,000	353,000	397,000	503,000	783,000	79,000	44,000	0
1987	1,312,000	380,000	331,000	394,000	1,157,000	157,000	35,000	0
1988	1,345,000	304,000	169,000	174,000	847,000	176,000	5,000	0
1989	557,000	128,000	203,000	95,000	1,000,000	80,000	0	304,000
1990	169,900	39,500	62,000	8,000	131,000	13,000	0	223,000
1991	209,500	18,000	106,000	20,000	391,000	8,000	14,000	190,000
1992	88,000	2,000	58,000	0	282,000	22,000	110,000	128,000
1993	66,000	12,000	72,000	21,000	265,000	3,000	0	149,000
Total	34,552,195	14,992,360	15,600,389	21,296,574	30,599,542	572,000	1,658,950	994,000

Notes:
- all data obtained from HLW Engineering Monthly Data Records
- ETF receipts were ETF evaporator bottoms to Tank 50

Appendix J.1 - Salt Removal Sequencing/ITP Production Plan

Cycle/ Batch	Start	Duration	Finish	Feed Tank	Volume fed to ITP (kgal)	Feed Type	Ppt Produced (kgal)	Ppt fed to Late Wash (kgal)	Tank 49 Ppt Level (kgal)	Filtrate Produced (kgal)	Notes
c1/b1	3/1/95	120	6/29/95	48	252	heel	0	0	0	361	planned ITP startup date
				38	130	cs					
					43	stpb					
					0	iw					
down	6/30/95	92	9/30/95				0	0	0	0	no chemical $
c1/b2	10/1/95	90	12/30/95	41	350	ds	0	0	0	519	resume ops
				38	25	cs					
				49	160	heel					
					7	stpb					
					0	iw					
c1/b3	12/31/95	90	3/30/96	41	500	ds	0	0	0	683	
				38	50	cs					
					11	stpb					
					150	iw					
c1/b4	3/31/96	60	5/30/96	32	200	us	0	0	0	662	
				38	50	cs					
				41	300	ds					
					17	stpb					
					130	iw					
wash	5/31/96	90	8/29/96				152	0	152	0	
c2/b1	8/30/96	30	9/29/96	38	50	cs	0	11	141	752	
				41	525	ds					
					17	stpb					
					180	ww					

Appendix J.1 - Salt Removal Sequencing/ITP Production Plan

Cycle/ Batch	Start	Duration	Finish	Feed Tank	Volume fed to ITP (kgal)	Feed Type	Ppt Produced (kgal)	Ppt fed to Late Wash (kgal)	Tank 49 Ppt Level (kgal)	Filtrate Produced (kgal)	Notes
c2/b2	9/30/96	30	10/30/96	38	50	cs	0	11	129	749	
				41	525	ds					
					11	stpb					
					180	ww					
c2/b3	10/31/96	30	11/30/96	38	50	cs	0	11	118	751	
				41	525	ds					
					11	stpb					
					180	ww					
c2/b4	12/1/96	30	12/31/96	29	75	cs	0	11	106	690	
				32	300	us					
				41	150	ds					
					24	stpb					
					175	ww					
c2/b5	1/1/97	30	1/31/97	29	50	cs	0	11	95	666	
				32	350	us					
				41	150	ds					
					22	stpb					
					125	lw					
wash	2/1/97	40	3/13/97				138	15	217	0	
c3/b1	3/14/97	30	4/13/97	25	65	cs	0	11	206	730	
				41	475	ds					
					35	stpb					
					200	ww					

Appendix J.1 - Salt Removal Sequencing/ITP Production Plan

Cycle/ Batch	Start	Duration	Finish	Feed Tank	Volume fed to ITP (kgal)	Feed Type	Ppt Produced (kgal)	Ppt fed to Late Wash (kgal)	Tank 49 Ppt Level (kgal)	Filtrate Produced (kgal)	Notes
c3/b2	4/14/97	30	5/14/97	25	50	cs	0	11	194	709	
				41	475	ds					
					19	stpb					
					200	ww					
c3/b3	5/15/97	30	6/14/97	25	55	cs	0	11	183	698	
				30	100	us					
				41	300	ds					
					27	stpb					
					260	ww					
wash	6/15/97	40	7/25/97				145	15	313	0	
c4/b1	7/26/97	30	8/25/97	25	400	ds	0	11	301	771	
				41	225	ds					Tk 41 empty
					18	stpb					
					150	ww					
c4/b2	8/26/97	30	9/25/97	25	575	ds	0	11	290	715	
					15	stpb					
					150	ww					
c4/b3	9/26/97	30	10/26/97	25	575	ds	0	11	278	717	
					15	stpb					
					150	ww					

Appendix J.1 - Salt Removal Sequencing/ITP Production Plan

Cycle/ Batch	Start	Duration	Finish	Feed Tank	Volume fed to ITP (kgal)	Feed Type	Ppt Produced (kgal)	Ppt fed to Late Wash (kgal)	Tank 49 Ppt Level (kgal)	Filtrate Produced (kgal)	Notes
c4/b4	10/27/97	30	11/26/97	25	550	ds	0	11	267	694	
					15	stpb					
					150	ww					
c4/b5	11/27/97	30	12/27/97	25	550	ds	0	11	255	694	
					15	stpb					
					150	ww					
wash	12/28/97	40	2/6/98				134	15	374	0	
c5/b1	2/7/98	30	3/9/98	25	600	ds	0	11	363	742	
					24	stpb					
					150	ww					
c5/b2	3/10/98	30	4/9/98	25	475	ds	0	11	351	660	Tk 25 empty
				30	50	us					
					16	stpb					
					150	ww					
c5/b3	4/10/98	30	5/10/98	28	100	cs	0	11	340	592	
				29	120	cs					
					43	stpb					
					300	ww					
					100	lw					
wash	5/11/98	40	6/20/98				156	15	481	0	

Appendix J.1 - Salt Removal Sequencing/ITP Production Plan

Cycle/ Batch	Start	Duration	Finish	Feed Tank	Volume fed to ITP (kgal)	Feed Type	Ppt Produced (kgal)	Ppt fed to Late Wash (kgal)	Tank 49 Ppt Level (kgal)	Filtrate Produced (kgal)	Notes
c6/b1	6/21/98	30	7/21/98	28	500	ds	0	11	469	764	
				30	75	us					
					30	stpb					
					200	ww					
c6/b2	7/22/98	30	8/21/98	27	50	cs	0	11	458	679	
				28	450	ds					
					26	stpb					
					200	ww					
c6/b3	8/22/98	30	9/21/98	27	50	cs	0	11	446	657	
				28	425	ds					
					25	stpb					
					200	ww					
wash	9/22/98	90	12/21/98				153	34	565	0	
c7/b1	12/22/98	30	1/21/99	27	50	cs	0	11	553	684	
				28	450	ds					
					39	stpb					
					200	ww					
c7/b2	1/22/99	30	2/21/99	27	50	cs	0	11	542	674	
				28	450	ds					
					26	stpb					
					200	ww					

Appendix J.1 - Salt Removal Sequencing/ITP Production Plan

Cycle/ Batch	Start	Duration	Finish	Feed Tank	Volume fed to ITP (kgal)	Feed Type	Ppt Produced (kgal)	Ppt fed to Late Wash (kgal)	Tank 49 Ppt Level (kgal)	Filtrate Produced (kgal)	Notes
c7/b3	2/22/99	30	3/24/99	28	450	ds	0	11	530	636	
					13	stpb					
					200	ww					
wash	3/25/99	320	2/8/00				155	122	563	0	
c8/b1	2/9/00	30	3/10/00	27	50	cs	0	11	552	733	
				28	500	ds					
					41	stpb					
					200	ww					
c8/b2	3/11/00	30	4/10/00	27	50	cs	0	11	540	673	
				28	450	ds					
					26	stpb					
					200	ww					
c8/b3	4/11/00	30	5/11/00	28	40	ds	0	11	529	419	Tk 28 empty
				30	200	us					
					16	stpb					
					200	ww					
wash	5/12/00	360	5/7/01				169	138	560	0	
c9/b1	5/8/01	30	6/7/01	27	100	cs	0	11	549	703	
				29	325	ds					
					54	stpb					
					300	ww					

Appendix J.1 - Salt Removal Sequencing/ITP Production Plan

Cycle/ Batch	Start	Duration	Finish	Feed Tank	Volume fed to ITP (kgal)	Feed Type	Ppt Produced (kgal)	Ppt fed to Late Wash (kgal)	Tank 49 Ppt Level (kgal)	Filtrate Produced (kgal)	Notes
c9/b2	6/8/01	30	7/8/01	27	75	cs	0	11	537	647	
				29	300	ds					
					29	stpb					
					300	ww					
wash	7/9/01	330	6/4/02				154	126	565	0	
c10/b1	6/5/02	30	7/5/02	27	100	cs	0	11	554	576	
				29	300	ds					
					53	stpb					
					200	ww					
wash	7/6/02	230	2/21/03				98	88	564	0	

Notes:

- Cycle 1 Production Plan and cycle time per HLW-ITP-94-0287, "ITP First Cycle Production Plan"
- Cycles 2 & 3 Production Plan per HLW-ITP-94-0376, "ITP Production Plan: Cycles 2 & 3" except Tank 25 dissolved salt solution (DSS) substituted for Tank 29 DSS
- ITP Cycle Time per HLW-ITP-94-0377, "Revised In-Tank Precipitation Operating Schedule" except where restricted by Tank 49 level limit of 565,000 gal
- Cycles 2 - 10 modeled via ITP Integrated Flowsheet Model (T. E. Pate, G. K. Georgeton, G. A. Taylor)
- Precipitate fed to Late Wash based on 26% attainment and sludge to precipitate ratio provided by A. S. Choi from most recent CPES modeling (1.517 gal of 10 wt % ppt to 1 gal of 19.5 wt % solids sludge)
- Abbreviations:

stpb = sodium tetraphenylborate	ds = dissolved salt
iw = inhibited water	us = unconcentrated supernate
ww = washwater	cs = concentrated supernate

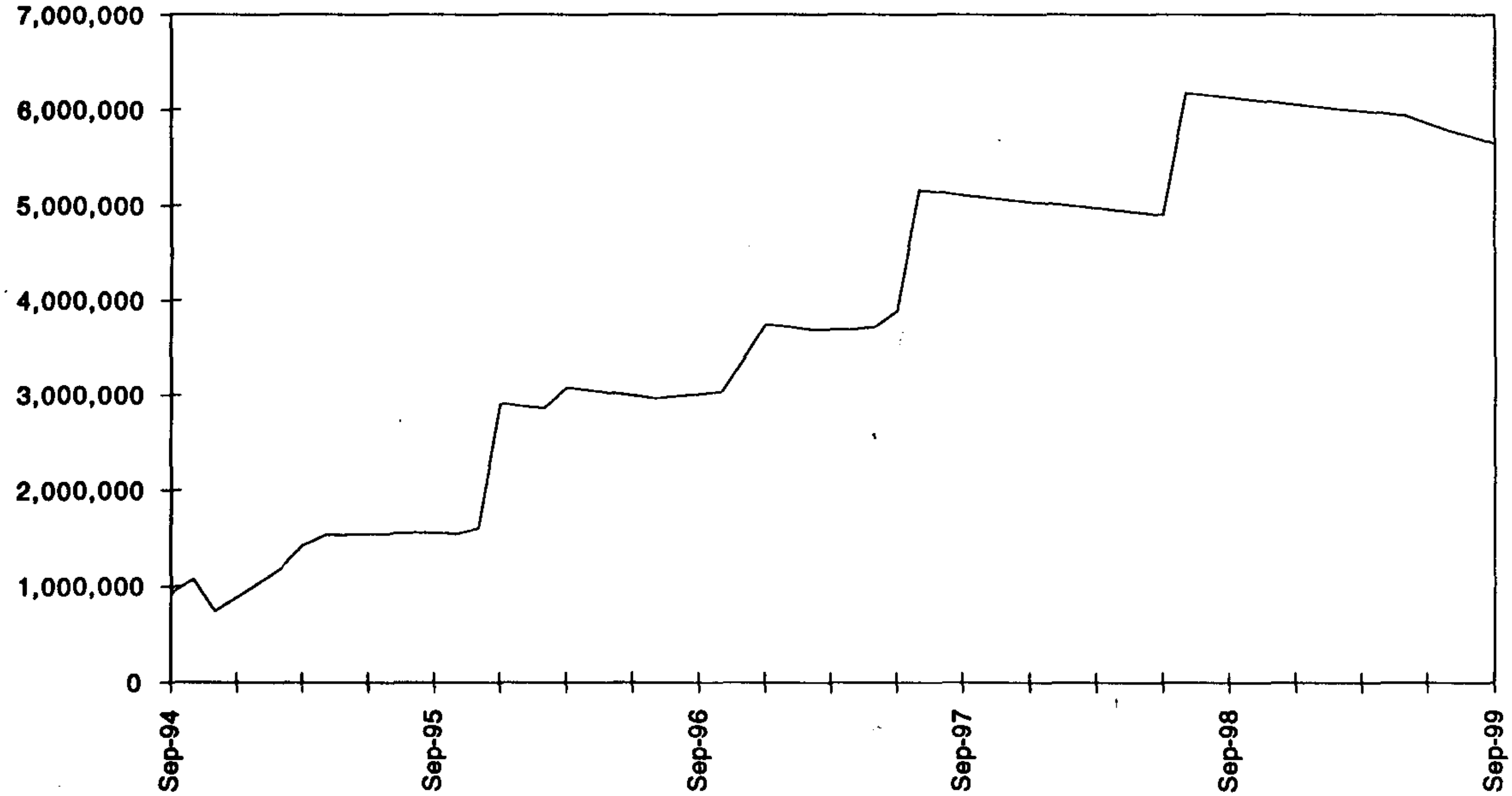
Appendix J.2 - Sludge Batches and Sequencing

Batch	Tank	Volume (gal)	Avail. Volume	Notes
1	15	126,000	91,000	Al dissolution (actual)
	18	376,000	341,000	
	21	182,000	182,000	
	22	30,000	30,000	
			-147,000	remaining heels in Tanks 42 & 51
		714,000	497,000	
2		173,000	173,000	sludge already in Tank 40
	8	164,000	164,000	
	11	140,000	70,000	Al dissolution 2:1
	15	312,000	156,000	Al dissolution 2:1
			-88,000	remaining heel in Tank 40
		789,000	475,000	
3	4	127,000	127,000	
	7	206,000	206,000	
	12	215,000	108,000	Al dissolution 2:1
	14	27,000	13,000	Al dissolution 2:1
	47	248,000	248,000	Sludge remaining after salt removal
		823,000	702,000	

Appendix J.2 - Sludge Batches and Sequencing

Batch	Tank	Volume (gal)	Avail. Volume	Notes
4	5	34,000	34,000	
	6	25,000	25,000	
	9	4,000	4,000	Sludge remaining after salt removal
	10	4,000	4,000	Sludge remaining after salt removal
	13	223,000	167,250	Al dissolution 4:3
	26	263,000	263,000	2F Evap. shut down during sludge removal
	35	52,000	26,000	Al dissolution 2:1
		605,000	523,250	
5	1	7,000	7,000	Sludge remaining after salt removal
	2	4,000	4,000	Sludge remaining after salt removal
	3	4,000	4,000	Sludge remaining after salt removal
	32	157,000	78,500	Al diss. 2:1, RHLWE down during sludge rem.
	33	42,000	42,000	
	34	45,000	45,000	
	39	93,000	46,500	Al dissolution 2:1
	43	192,000	192,000	2H Evap. shut down during sludge removal
			88,000	Tank 51 heel removed at end of batch feed
		544,000	507,000	
6	17	2,000	2,000	residual heel from 1985-6 sludge rem. campaign
	18	42,000	42,000	residual heel from 1985-6 sludge rem. campaign
	19	20,000	20,000	residual heel from 1985-6 salt rem. campaign
	21	14,000	14,000	residual heel from 1985-6 sludge rem. campaign
	22	60,000	60,000	residual heel from 1985-6 sludge rem. campaign
	23	43,000	43,000	
	24	4,000	4,000	residual heel from 1985-6 salt rem. campaign
			147,000	Tanks 42 & 40 heels removed at end of batch feed
		185,000	332,000	

Appendix J.3 - Tank Farm Material Balance Graph



Appendix J.4 - Tank Farm Material Balance Database

End of Mo/Year	Influents F-LHW	F-HHW	H-LHW	H-HHW	DWPF	Tank WW	ESP	Effluents 2H Evap	2F Evap	RHLWE	ITP	Other	Working Inventory	Notes
Sep-94													924,000	Starting space in Type III's minus F/H Em Spare
Oct-94	3,500	30	10,940	0	0	0	0	104,167	58,333	0	0	0	1,072,030	
Nov-94	3,500	30	10,940	0	0	0	482,000	104,167	58,333	0	0	0	738,060	
Dec-94	3,500	30	10,940	0	0	0	0	104,167	58,333	0	0	0	886,090	
Jan-95	3,500	30	10,940	0	0	0	0	104,167	58,333	0	0	0	1,034,120	
Feb-95	3,500	30	10,940	0	0	0	350,000	104,167	58,333	0	0	350,000	1,182,150	ESP washwater to Tk 24
Mar-95	37,050	4,810	10,940	0	0	0	0	104,167	58,333	0	130,000	0	1,421,850	Tank 38 conc sup to ITP
Apr-95	37,050	4,810	10,940	0	0	0	0	104,167	58,333	0	0	0	1,531,550	
May-95	37,050	4,810	10,940	0	0	0	350,000	0	58,333	0	0	350,000	1,537,083	ESP washwater to Tk 24
Jun-95	37,050	4,810	10,940	0	0	0	0	0	58,333	0	0	0	1,542,616	
Jul-95	37,050	4,810	10,940	0	0	0	0	0	58,333	0	0	0	1,548,149	
Aug-95	37,050	4,810	10,940	0	0	0	225,000	0	58,333	0	0	225,000	1,553,682	ESP washwater to Tk 24
Sep-95	37,050	4,810	10,940	0	0	0	0	0	58,333	0	0	0	1,559,215	
Oct-95	36,160	4,830	31,700	23,250	0	0	0	0	51,610	0	25,000	0	1,539,885	Tank 38 conc sup to ITP
Nov-95	36,160	4,830	31,700	23,250	0	0	0	104,167	51,610	0	0	0	1,599,722	
Dec-95	36,160	4,830	31,700	23,250	0	0	0	104,167	51,610	0	50,000	1,200,000	2,909,559	Tank 38 conc sup to ITP/Tk 42 as Emer Spare
Jan-96	36,160	4,830	31,700	23,250	159,958	0	0	166,507	61,170	0	0	0	2,881,337	
Feb-96	36,160	4,830	31,700	23,250	159,958	0	0	166,507	61,170	0	0	0	2,853,116	
Mar-96	36,160	4,830	31,700	23,250	159,958	0	0	166,507	61,170	0	250,000	0	3,074,894	Tank 32 - 200 kgal, Tank 38 - 50 kgal to ITP
Apr-96	36,160	4,830	31,700	23,250	159,958	0	0	166,507	61,170	0	0	0	3,046,673	
May-96	36,160	4,830	31,700	23,250	159,958	0	0	166,507	61,170	0	0	0	3,018,452	
Jun-96	36,160	4,830	31,700	23,250	159,958	0	0	166,507	61,170	0	0	0	2,990,230	
Jul-96	36,160	4,830	31,700	23,250	159,958	0	0	166,507	61,170	0	0	0	2,962,009	
Aug-96	36,160	4,830	31,700	23,250	159,958	0	0	166,507	61,170	0	50,000	0	2,983,787	Tank 38 conc sup to ITP
Sep-96	36,160	4,830	31,700	23,250	159,958	0	0	166,507	61,170	0	50,000	0	3,005,566	Tank 38 conc sup to ITP
Oct-96	33,660	4,450	30,930	23,250	159,958	0	0	165,960	58,578	0	50,000	0	3,027,856	Tank 38 conc sup to ITP
Nov-96	33,660	4,450	30,930	23,250	159,958	0	0	165,960	58,578	0	375,000	0	3,375,147	Tank 29 - 75 kgal, Tank 32 - 300 kgal to ITP
Dec-96	33,660	4,450	30,930	23,250	159,958	0	0	165,960	58,578	0	400,000	0	3,747,437	Tank 29 - 50 kgal, Tank 32 - 350 kgal to ITP
Jan-97	33,660	4,450	30,930	23,250	166,966	0	0	165,960	65,306	0	0	0	3,719,447	
Feb-97	33,660	4,450	30,930	23,250	166,966	0	0	165,960	65,306	0	0	0	3,691,457	
Mar-97	33,660	4,450	30,930	23,250	166,966	0	0	165,960	65,306	0	25,000	0	3,688,467	Tank 29 conc sup to ITP, Tank 41 empty
Apr-97	33,660	4,450	30,930	23,250	166,966	0	0	165,960	65,306	0	30,000	0	3,690,477	Tank 29 conc sup to ITP
May-97	33,660	4,450	30,930	23,250	166,966	0	0	165,960	65,306	0	50,000	0	3,712,487	Tank 38 conc sup to ITP
Jun-97	33,660	4,450	30,930	23,250	166,966	0	0	165,960	65,306	0	200,000	0	3,884,497	Tks 27&28 - 100 kgal each, Tk 29 - 175 kgal to ITP
Jul-97	33,660	4,450	30,930	23,250	166,966	0	0	165,960	65,306	0	1,300,000	0	5,156,507	Tank 41 Return To Salt Service (RTSS)
Aug-97	33,660	4,450	30,930	23,250	166,966	0	0	165,960	65,306	0	0	0	5,128,518	
Sep-97	33,660	4,450	30,930	23,250	166,966	0	0	165,960	65,306	0	0	0	5,100,528	
Oct-97	7,660	520	22,100	23,250	166,966	0	0	159,691	37,786	0	0	0	5,077,509	
Nov-97	7,660	520	22,100	23,250	166,966	0	0	159,691	37,786	0	0	0	5,054,490	
Dec-97	7,660	520	22,100	23,250	166,966	0	0	159,691	37,786	0	0	0	5,031,471	
Jan-98	7,660	520	22,100	23,250	173,974	0	0	159,691	44,514	0	0	0	5,008,172	
Feb-98	7,660	520	22,100	23,250	173,974	0	0	159,691	44,514	0	0	0	4,984,873	
Mar-98	7,660	520	22,100	23,250	173,974	0	0	159,691	44,514	0	0	0	4,961,574	Tank 25 empty
Apr-98	7,660	520	22,100	23,250	173,974	0	0	159,691	44,514	0	0	0	4,938,274	
May-98	7,660	520	22,100	23,250	173,974	0	0	159,691	44,514	0	0	0	4,914,975	
Jun-98	7,660	520	22,100	23,250	173,974	0	0	159,691	44,514	0	0	0	4,891,676	
Jul-98	7,660	520	22,100	23,250	173,974	0	0	159,691	44,514	0	1,300,000	0	6,168,377	Tk 25 RTSS
Aug-98	7,660	520	22,100	23,250	173,974	0	0	159,691	44,514	0	0	0	6,145,078	
Sep-98	7,660	520	22,100	23,250	173,974	0	0	159,691	44,514	0	0	0	6,121,779	
Oct-98	7,660	520	22,100	23,250	173,974	0	0	159,691	44,514	0	0	0	6,098,479	
Nov-98	7,660	520	22,100	23,250	173,974	0	0	159,691	44,514	0	0	0	6,075,180	

Appendix J.4 - Tank Farm Material Balance Database

End of	Influents							Effluents					Working	
Mo/Year	F-LHW	F-HHW	H-LHW	H-HHW	DWPF	Tank WW	ESP	2H Evap	2F Evap	RHLWE	ITP	Other	Inventory	Notes
Dec-98	7,660	520	22,100	23,250	173,974	0	0	159,691	44,514	0	0	0	6,051,881	
Jan-99	7,660	520	22,100	23,250	180,982	0	0	159,691	51,242	0	0	0	6,028,302	
Feb-99	7,660	520	22,100	23,250	180,982	0	0	159,691	51,242	0	0	0	6,004,722	
Mar-99	7,660	520	22,100	23,250	180,982	0	0	159,691	51,242	0	0	0	5,981,143	
Apr-99	7,660	520	22,100	23,250	180,982	0	0	159,691	51,242	0	0	0	5,957,563	
May-99	7,660	520	22,100	23,250	180,982	0	0	159,691	51,242	0	0	0	5,933,984	
Jun-99	7,660	520	22,100	23,250	180,982	0	0	159,691	0	0	0	0	5,859,163	2F assumed to fail, 6 month outage
Jul-99	7,660	520	22,100	23,250	180,982	0	0	159,691	0	0	0	0	5,784,342	
Aug-99	3,500	30	22,100	23,250	180,982	0	0	159,691	0	0	0	0	5,714,171	
Sep-99	3,500	30	22,100	23,250	180,982	0	0	159,691	0	0	0	0	5,644,000	
2000	30,000	360	265,200	279,000	2,255,770	0	0	1,916,292	647,387	0	1,300,000	0	6,677,349	Tk 28 RTSS
2001	30,000	360	265,200	279,000	2,255,770	0	0	1,916,292	232,020	437,539	0	0	6,432,870	RHLWE starts up 5/01
2002	48,000	360	108,400	69,750	2,255,770	0	683,335	1,804,964	285,383	787,407	0	-1,200,000	4,945,008	Tk 42 returns to ESP service
2003	30,000	360	30,000	0	2,255,770	0	1,640,004	1,749,300	495,091	1,277,221	1,300,000	0	5,810,487	Tk 29 RTSS
2004	30,000	360	30,000	0	2,255,770	520,000	1,640,004	1,749,300	696,974	1,543,339	0	0	5,843,965	
2005	30,000	360	30,000	0	2,558,463	0	136,657	1,749,300	62,127	798,093	1,300,000	0	6,998,005	Tk 38 RTSS, Tk 14 emptied
2006	30,000	360	30,000	0	2,558,463	0	1,469,997	1,749,300	446,129	1,480,763	1,300,000	0	7,885,377	Tk 47 RTSS
2007	30,000	360	30,000	0	2,558,463	140,000	1,959,996	1,749,300	641,602	1,803,289	1,300,000	0	8,800,750	Tk 31 RTSS
2008	30,000	360	30,000	0	2,558,463	380,000	1,470,007	1,749,300	593,661	1,675,239	1,300,000	0	10,030,120	Tk 41 RTSS
2009	30,000	360	30,000	0	3,000,861	0	0	1,749,300	22,770	1,152,827	0	0	9,893,795	Tks 9 & 10 emptied
2010	30,000	360	30,000	0	3,000,861	330,000	0	1,749,300	150,888	1,321,709	1,300,000	0	11,354,471	Tk 37 emptied
2011	30,000	360	30,000	0	3,000,861	330,000	1,283,337	1,749,300	520,489	1,978,777	0	0	11,258,479	Tk 1 emptied
2012	30,000	360	30,000	0	3,000,861	470,000	1,400,004	1,749,300	608,442	2,110,158	0	0	11,265,154	Tks 2 & 3 emptied
2013	30,000	360	30,000	0	3,000,861	140,000	816,659	1,749,300	312,321	1,642,603	1,300,000	0	12,391,498	Tk 30 RTSS
2014	30,000	360	30,000	0	2,907,724	420,000	816,659	1,749,300	421,027	1,698,486	1,300,000	0	13,773,567	Tk 36 emptied
2015	30,000	360	30,000	0	2,907,724	0	1,400,004	1,749,300	425,971	1,780,217	1,300,000	0	14,660,967	Tk 44 emptied
2016	30,000	360	30,000	0	2,907,724	140,000	1,283,327	1,749,300	446,721	1,792,126	1,300,000	0	15,697,703	Tks 25 & 27 emptied
2017	30,000	360	30,000	0	2,931,008	140,000	560,004	1,749,300	238,404	1,444,137	1,300,000	0	16,878,172	Tks 28 & 45 emptied
2018	30,000	360	30,000	0	2,931,008	700,000	560,004	1,749,300	455,816	1,730,725	1,300,000	0	18,562,640	Tk 29 emptied
2019	30,000	360	30,000	0	2,791,304	420,000	280,002	1,749,300	266,469	1,309,954	1,300,000	0	20,056,698	Tk 38 emptied
2020	30,000	360	30,000	0	2,791,304	140,000	0	1,749,300	77,123	1,023,299	1,300,000	0	21,354,756	Tk 30 emptied

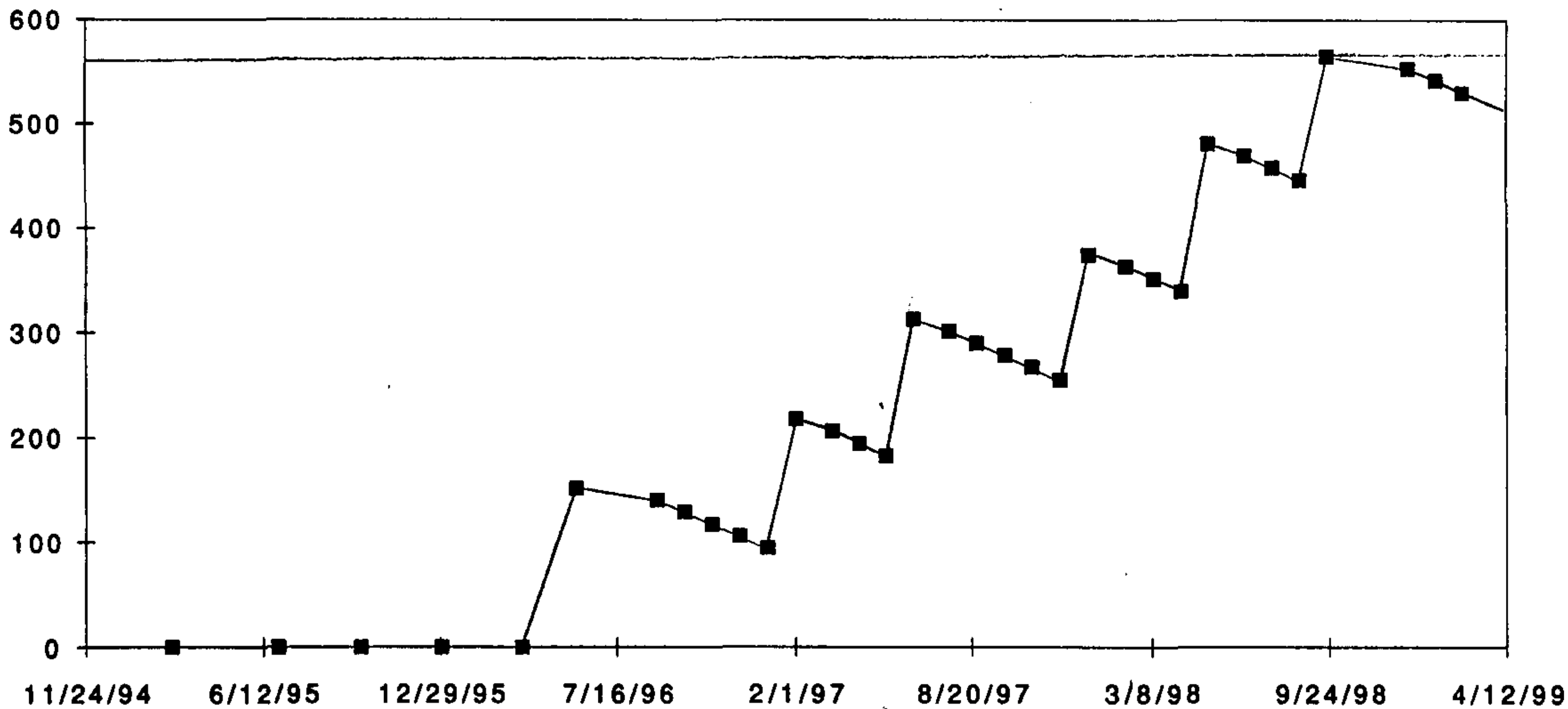
Appendix J.4 - Tank Farm Material Balance Database

End of	Influents							Effluents					Working	
Mo/Year	F-LHW	F-HHW	H-LHW	H-HHW	DWPF	Tank WW	ESP	2H Evap	2F Evap	RHLWE	ITP	Other	Inventory	Notes

Notes:

- F-LHW: F-Canyon restarts 3/95 and shuts down 7/99, uptime flows per NMP-PLS-94-0380
- F-HHW: F-Canyon restarts 3/95 and shuts down 7/99, uptime flows per NMP-PLS-94-0380
- H-LHW: H-Canyon restarts 10/95 and shuts down 1/02, uptime flows per NMP-PLS-94-0380
- H-HHW: H-Canyon restarts 10/95 and shuts down 1/02, uptime flows per NMP-PLS-94-0380
- RBOF planning basis is 100,000 gal/mo generated of which 30,000 gal gp to the Tank Farm and 70,000 gal/mo goes to the GP Evaporator. The 30,000 gal is stored for salt dissolution water.
- Reactor Basin sludge transported to the Tank Farm is planned to be zero. The historical average is 35,200 gal/yr.
- DWPF recycle is a function of the planned attainment for the 6 batches of sludge per WSRC-TR-93-0677, Rev. 0.
- Tank washwater based on remove from service dates in Appendix C, 140 kgal for new tanks, 190 kgal for failed tanks.
- ESP washwater per memo, A. S. Choi to N. R. Davis, 5/25/94, for each batch. Washwater is assumed to be generated evenly for 30 months prior to feeding each batch to DWPF.
- 1H Evaporator is assumed to remain down indefinately.
- 2H Evaporator has planned 6 month outage starting 5/95 to replace pot. Space gain based on available feed as follows:
  - all H-LHW goes to 2H, space gain factor is 4:1
  - the first 1.8 Mgal/year of DWPF Recycle goes to 2H, space gain factor is 25:1
- 2F Evaporator is assumed to fail 6/99 and require a 6 month outage. Space gain based on available feed as follows:
  - FY95 planned space gain set by HLW System Integration Manager based on available and forecasted feed
  - All F & H-HHW goes to 2F, space gain factor is 4:1
  - All F-LHW goes to 2F, space gain factor is 4:1
  - 36% of all ESP washwater goes to 2F, space gain factor is 5:1
  - Starting 2001, 300,000 gal of empty tank washwater is generated and goes to 2F, space gain factor is 10:1
  - DWPF recycle above 1.8 Mgal/yr goes to 2F until RHLWE starts up, space gain factor is 25:1
- RHLWE is assumed to start up 5/01, space gain based on available feed as follows:
  - DWPF Recycle above first 1.8 Mgal/year goes to RHLWE, space gain factor is 25:1
  - 64% of all ESP washwater goes to RHLWE, space gain factor is 5:1
  - Starting 2001, empty tank washwater is generated at 400,000 gal/year and goes to RHLWE, space gain factor is 10:1
- ITP is planned to start up 3/95, operate at low attainment through 8/96, and on the normal 130 day cycle thereafter until limited by precipitate capacity.
- The "Other" column shows transfers of dilute waste out of Type III Tanks for use as waste removal water and the changing use of Tank 42 as emergency spare.
- The "Available Space" column shows the useable storage space in Type III Tanks, i.e., this does not count the 1,300,000 gal of emergency spare space per Tank Farm, ITP or ESP tanks except as noted.

Appendix J.5 - Tank 49 Precipitate Level



Appendix K - High Level Waste Management Manpower

ADS #	Title	FY95	FY96	FY97	FY98	FY99	FY00
21-AA	DWPF Program Management	34	32	31	30	30	30
22-AA	Vitrification	1,030	894	809	792	790	788
23-AA	Saltstone Z-Area	54	49	61	60	60	59
24-GP	General Plant Projects	0	0	0	0	0	0
25-LI	New Facility Planning	2	0	0	0	0	0
26-LI	Defense Waste Processing Facility	0	0	0	0	0	0
	Total Defense Waste	1,120	975	901	882	880	877
31-AA	HLW Program Management	157	153	148	145	146	145
32-AA	H-Tank Farm	371	375	360	352	362	358
33-AA	F-Tank Farm	277	267	256	251	260	257
34-AA	ITP/ESP	323	303	289	283	284	280
35-AA	Effluent Treatment Facility	116	124	114	109	109	101
37-GP	HLW General Plant Projects	0	0	0	0	0	0
38-LI	HLW New Facility Planning	1	2	3	8	10	13
39-LI	New Waste Transfer Facility	78	9	0	0	0	0
310-LI	RHLWE	27	28	28	69	67	64
311-LI	DB & Pump Pit Containment	1	0	0	0	0	0
314-LI	Waste Removal	67	61	87	99	99	99
315-LI	Tank Farm Services Upgrade	0	5	7	9	0	0
	Total High Level Waste	1,418	1,327	1,292	1,325	1,337	1,317
	Total HLW Management Division	**2,538**	**2,302**	**2,193**	**2,207**	**2,217**	**2,194**

Appendix L - HLW Priorities

1. Essential Base Program

    1a. health & safety of workers & public
    1b. stewardship of current waste inventories
    1c. improvement programs critical to 1a and 1b
    1d. maintenance of facilities to ensure 1a and 1b

2. "In Progress" projects/programs to handle waste safely

    2a. Evaporator operations
    2b. In-Tank Precipitation and Tank 41 salt removal
    2c. Saltstone operation and vault capping
    2d. L-ETF Operation
    2e. M-Area Sludge Stabilization

3. High Level Waste System to support DWPF sludge startup

    3a. DWPF Vitrification startup
    3b. ESP batch#1 processing
    3c. Waste Removal as required to maintain evaporator operation to handle recycle (F to H-Area IAL, F-Area Waste Removal infrastructure, Tanks 25 and 28 salt removal)
    3d. New Waste Transfer Facility startup

4. HLW System to support DWPF sludge & precipitate operations

    4a. Late Wash Project
    4b. Late Wash Filter Demonstration Unit

Appendix L - HLW Priorities

5. Continuity of operations at low attainment

    5a. Provide precipitate feed (H-Area Waste Removal infrastructure, Tanks 29 and 38 salt removal)
    5b. Sludge Batch#2 (Tanks 8, 11, 15)
    5c. Space Gain to support Sludge Batch#2 washing (RHLWE or SMECT water reduction or both)
    5d. H-Area Control Room and support for RHLWE
    5e. Continued operation of RHLWE (Tank 31 salt removal)

6. Productivity Improvement Programs

    - H-Area Control Room Consolidation
    - Saltstone Vault#4 permanent roof
    - slurry pump improvements
    - Ion Exchange as replacement for ITP

7. Increase System Attainment

    - Diversion Box & Pump Pit Containment
    - ITP process enhancements
    - Accelerate repatitive projects (Saltstone Vaults, Waste Removal)
    - Additional raw materials to support higher attainment

8. Reduce Program Risk

    - Benzene Abatement
    - Precipitate Hydrolysis Experimental Facility
    - Alternative Technologies
    - Project Contingency

Appendix M - Funding

		EAC	AOP	FY96 escalated @ 3%				
ADS #	Title	FY94	FY95	FY96	FY97	FY98	FY99	FY00
21-AA	DWPF Program Management	17,560	28,075	25,754	25,451	25,690	26,461	27,437
22-AA	Vitrification	153,424	176,178	150,445	152,468	158,766	161,060	171,719
23-AA	Saltstone Z-Area	8,134	10,342	18,613	24,858	21,518	28,382	20,791
24-GP	General Plant Projects	0	500	1,500	2,356	3,214	3,326	3,443
25-LI	DWPF New Facility Planning	0	824	0	43	2,544	2,613	4,364
26-LI	DWPF (Line Item)	63,510	45,057	0	0	0	0	0
31-AA	HLW Program Management	31,701	47,232	49,148	48,023	48,559	49,720	51,333
32-AA	H-Tank Farm	66,423	67,855	68,261	64,977	65,925	68,825	69,141
33-AA	F-Tank Farm	40,205	46,581	43,732	43,756	43,990	45,280	46,094
34-AA	ITP/ESP	83,474	62,541	60,355	63,819	61,182	63,118	63,622
35-AA	Effluent Treatment Facility	18,048	20,035	22,048	22,138	21,567	21,500	20,986
37-GP	HLW General Plant Projects	0	1,500	1,500	1,630	3,279	3,480	2,080
38-LI	HLW New Facility Planning	3,000	459	1,643	3,179	7,180	11,406	11,558
39-LI	New Waste Transfer Facility	3,071	9,337	932	0	0	0	0
310-LI	RHLWE	14,179	15,404	4,000	4,000	13,039	15,962	15,840
311-LI	DB & Pump Pit Containment	2,182	514	0	0	0	0	0
314-LI	Waste Removal	29,595	33,460	25,953	30,155	37,285	37,573	46,942
315-LI	Tank Farm Services Upgrade (H-Area)	0	0	4,565	10,200	7,805	473	0
14-AA	Defense Programs (Rx Materials)	1,354	2,369	8,508	4,936	121	0	0
36-AA	L-Effluent Treatment Facility	8,177	7,665	7,194	6,988	2,581	796	822
	Total High Level Waste	**544,037**	**575,928**	**494,151**	**508,977**	**524,245**	**539,975**	**556,172**

Appendix N - HLW Projects

FY	Project #	ADS	Project Title	TEC (K)	Driver	Scope
79	S-2081	314-LI Capital	Waste Removal and Extended Sludge Processing	$307,050	• Waste Removal FFA	This FY79 project provides a sludge processing facility and equipment needed facilities to remove high level radioactive waste from 23 underground waste tanks. Facilities include slurry pumps and transfer jets or pumps for each tank, control room expansions, motor control centers and services to all tanks.
82	S-1780	26-LI Capital 81-T-105	Defense Waste Processing Facility	$1,276,469	• STP • Waste Removal FFA	This FY82 line item provides a process building to receive washed sludge and salt precipitate from the Tank Farms and incorporate this waste into a stable glass waste form suitable for final disposition in a future federal repository. Facilities include the main processing building, a sand filter building, control rooms, an effluent treatment area, an interim glass waste storage building, support services and administrative offices.
84	S-3781	34-AA Op Ex (includes S-1588)	In-Tank Precipitation	$131,390	• Waste Removal FFA	This FY84 project provides a process to pretreat salt waste for disposition as either saltstone or glass. Facilities include a filter building, a cold chemical area, a control room, slurry and transfer pumps, and support services. Also now includes the scope of project S-1588.

Appendix N - HLW Projects

FY	Project #	ADS	Project Title	TEC (K)	Driver	Scope
85	S-3122	39-LI Capital 85-D-159 (includes S2835)	New Waste Transfer Facility	$54,871	• STP • Waste Removal FFA	This FY85 project replaces an existing obsolete diversion box/pump pit waste transfer facility with one of current design. NWTF is needed to support DWPf operations and h to F-Area transfers. The facility consists of four pump pits with tanks and pumps, one large diversion box, and an enclosure building with remotely operated bridge crane and control room.
87	S-2821	311-LI Capital 87-D-181	Diversion Box and Pump Pit Containment	$24,100	• Rad exposure reduction, im-prove system attainment	This FY87 project provides an enclosure building over H-Area Diversion Box no. 7 (HDB-7). Facilities include a remotely operated bridge crane, a ventilation system, and a mobile control room.
87	S-2787	45-LI Capital 83-D-148	Consolidated Incineration Facility	$87,295	• STP • Waste Removal FFA	This FY87 project provides a facility to incinerate hazardous, low-level radioactive, and mixed waste and particularly the DWPF benzene. Facilities include a large rotary kiln incinerator, offgas treatment, feed storage and ash handling systems and a control room.
87	S-3291	314-LI Capital	Type III Tanks Salt Removal, Phase I	$47,800	• Waste Removal FFA	This FY87 project provides facilities to remove waste from three tanks (25, 28, and 29), support services and process control equipment, and an expansion to control room building 241-18F to support the waste removal operation.

Appendix N - HLW Projects

FY	Project #	ADS	Project Title	TEC (K)	Driver	Scope
88	S-1588	34-AA Op Ex	ITP Safety and Environmental Enhancements	$36,830	• Waste Removal FFA	This FY88 project provides a fire water suppression system, a liquid nitrogen storage and unloading system, two benzene strippers, a laboratory, and other miscellaneous equipment in support of the ITP project.
89	S-2860	314-LI Capital	Type III Tanks Salt Removal, Phase II	$106,500	• Waste Removal FFA	This FY89 project provides facilities to remove waste from two tanks (31 & 47) and a new control room (241-2H) that will support waste removal from 17 other waste tanks as well as the RHLWE.
89	S-4062	310-LI Capital 89-D-174	Replacement High Level Waste Evaporator	$118,200	• STP • Waste Removal FFA • Improve HLW System attainment	This FY89 project provides a cost-effective waste evaporator to replace the aging 1H Evaporator and to support the increased waste load from the DWPF. Facilities include a process cell, a large evaporator with all supporting tanks, pumps and piping, and an enclosure building with remotely controlled crane.
90	S-3066	32-AA	Alternate Evaporator	$1,000	• STP • Waste Removal FFA	This FY90 projects provides an uninstalled spare evaporator vessel that can be used in the 1H, 2H or 2F cell.
93	S-4391	22-AA Op Ex	Late Wash Filter Demonstration Unit	$1,730	• STP • Waste Removal FFA	This FY93 project provides a temporary facility to demonstrate and optimize the Late Wash filtration process.
93	S-5575	38-LI Op Ex	Ion Exchange Skid	$1,125	• Improve HLW System attainment	This FY93 project provides a facility to demonstrate the IX process using SRS, Hanford and Oak Ridge simulated waste.

Appendix N - HLW Projects

FY	Project #	ADS	Project Title	TEC (K)	Driver	Scope
93	S-3025	314-LI Capital (part of 93-D-187)	Waste Removal Facilities, Phase III	$112,500	• Waste Removal FFA	This FY93 project provides facilities to remove waste from six tanks (26, 30, 35-38). Facilities include slurry pumps, transfer jets/pumps, support services and process control equipment.
94	S-5556	22-AA Op Ex	IDMS Ammonia Scrubber	$500	• STP • Waste Removal FFA	This FY94 project provides modifications to the IDMS demonstration facility to make it compatible with recent DWPF equipment modifications.
96	S-3898	23-AA Op Ex	Saltstone Vault#2	$17,525	• Waste Removal FFA	This project will provide a reinforced concrete 12 cell storage vault for saltstone grout in support of the ongoing ITP operation. Vault#2 need date 8/97.
96	S-4558	315-LI Capital 96-SR-161	Tank Farm Services Upgrade (H-Area)	$21,070	• Improve HLW System attainment • Maintain Tank Farm infrastructure	This project provides services to replace aging facilities including a) F-Area electrical, b) F and H-Area Tank Farm 25, 150 and 325 psi steam, domestic and cooling water, and breathing and instrument air lines, c) steam and waste transfer equipment for Tanks 35-37, and d) increased cooling to support ITP/ESP.
97	W-3014	38-LI Capital	Sampling/Monitoring System Upgrade	$10,000	• Correct EPA identified deficiencies	This project provides air sampling equipment for waste tanks and process cells as needed in the Tank Farm.

Appendix N - HLW Projects

FY	Project #	ADS	Project Title	TEC (K)	Driver	Scope
98	S-2048	25-LI 98-WM-1	Failed Equipment Storage Vaults#3-6	$4,700	• STP • Waste Removal FFA	This proposed project provides four additional storage vaults to store failed melters or other equipment that contains high level contamination.
98	S-4881	38-LI Capital	Tank Farm Storm Water System Upgrade	$12,000	• Maintain Tank Farm safety envelope	This proposed project will relieve potential flooding in the Tanks 9-12 area of the H-Area Tank Farm.
TBD	TBD	23-AA Op Ex	Saltstone Vault#3	$20,800	• STP • Waste Removal FFA	This project will provide a reinforced concrete 12 cell storage vault for saltstone grout in support of the ongoing ITP operation. Vault#3 need date 8/99.
TBD	S-4878	38-LI Capital	ITP Benzene Abatement	$14,000	• Clean Air Act of 1990	The CAA of 1990 mandated that states promulgate laws within 10 years to reduce benzene emissions by 95%. This law, when passed, will apply to ITP which must then comply within 3 years. This proposed project provides a catalytic incinerator at 3 point sources within ITP. Not funded in FY96 FYP Target Case.
TBD	S-2093	25-LI Capital	DWPF Salt Cell Benzene Abatement	$15,000	• Clean Air Act of 1990	The CAA of 1990 mandated that states promulgate laws within 10 years to reduce benzene emissions by 95%. This law, when passed, will apply to DWPF which must then comply within 3 years. This proposed project provides a catalytic incinerator at 1 point source within DWPF. Not funded in FY96 FYP Target Case.

Appendix N - HLW Projects

FY	Project #	ADS	Project Title	TEC (K)	Driver	Scope
TBD	TBD	25-LI Capital	Recycle Stream Volume Reduction	TBD	• Improve HLW System attainment	This proposed project will provide facilities and equipment to reduce the volume of the DWPF recycle stream. Not funded in FY96 FYP Target Case.
TBD	W-3008	38-LI Capital 98-SR-387	Support Services for Tank Farms F and H-Area)	$30,000	• Maintain Tank Farm infrastructure • Improve HLW System attainment	This proposed project replaces aging service piping in the F and H-Area Tank Farms not covered by project S-4558 including, 25, 150 and 325 psi steam, domestic and cooling water, and breathing and instrument air lines.
TBD	TBD	25-LI Capital 99-SR-184	703-S Administration Building	$7,000	• QA document control requirements	This proposed project provides an office building to replace numerous temporary facilities for 300 people and will enable DWPF Records Management to meet QA requirements.
TBD	TBD	23-AA Op Ex	Saltstone Vault#5	$20,800	• Waste Removal FFA	This proposed project will provide a reinforced concrete 12 cell storage vault for saltstone grout in support of the ongoing ITP operation. Vault#5 need date 8/01.

Appendix O - Acronyms

ADS	Activity Data Sheet
AOP	Annual Operating Plan
APP	Auxiliary Pump Pit
CAA	Clean Air Act
CAB	Citizen's Advisory Board
CCR	Cold Chemical Runs
CDR	Conceptual Design Report
CIF	Consolidated Incinerator Facility
Ci/gal	Curies per gallon
CPES	Chemical Process Evaluation System
CRC	Cesium Removal Column
DB&PP	Diversion Box & Pump Pit
D&D	Decontaminate & Decommission
DNFSB	Defense Nuclear Facility Safety Board
DOE	Department of Energy
DP	Defense Programs
DW	Defense Waste
DWPF	Defense Waste Processing Facility
EA	Environmental Assessment
EAC	Estimate at Completion
EIS	Environmental Impact Statement
EM	Environmental Management
EPA	Environmental Protection Agency
ERDA	Energy Research and Development Administration
ER/WM	Environmental Restoration/Waste Management
ESAAB	Energy Systems Advisory Acquisition Board
ESP	Extended Sludge Processing
ETF	Effluent Treatment Facility
FDB	F-Area Diversion Box
FDC	Functional Design Criteria
FEIS	Final Environmental Impact Statement
FESV	Failed Equipment Storage Vault
FFA	Federal Facility Agreement
FFCA	Federal Facility Compliance Agreement
FPR	Functional Performance Requirements
FRR	Foreign Research Reactors
FTE	Full Time Equivalent
FY	Fiscal Year
FYP	Five Year Plan
ITP	In-Tank Precipitation
GP	General Purpose
GPM	Gallons per minute
GWSB	Glass Waste Storage Building
H & V	Heating & Ventilation
HAD	Hazards Assessment Document
HDA	Hydrogen Deflagration Analysis
HDB	H-Area Diversion Box
HHW	High Heat Waste
HLW	High Level Waste
HLWM	High Level Waste Management
HQ	Headquarters - usually as a suffix to DOE
IAL	Inter-Area Line
IFM	Integrated Flowsheet Model
INMM	Integrated Nuclear Material Management
ITP	In-Tank Precipitation
JCO	Justification for Continued Operation
LCO	Limiting Condition of Operation
LDR	Land Disposal Restriction

Appendix O - Acronyms

LHW	Low Heat Waste
LI	Line Item
LPPP	Low Point Pump Pit
LW	Late Wash
N/A	Not Applicable
NEPA	National Environmental Policy Act
NESHAP	National Emissions Standards for Hazardous Air Pollutants
NFP	New Facility Planning
NPDES	National Pollution Discharge Elimination System
NWTF	New Waste Transfer Facility
OPC	Other Project Costs
ORR	Operational Readiness Review
OSR	Operational Safety Requirement
OTD	Office of Technology Development
PCCS	Product Composition Control System
PID	Process Interface Document
PMP	Project Management Plan
PRA	Probabilistic Risk Assessment
PVT	Process Verification Test
QA	Quality Assurance
RBOF	Receiving Basin for Offsite Fuels
RCRA	Resource Conservation and Recovery Act
RHLWE	Replacement High Level Waste Evaporator
ROD	Record of Decision
RSA	Readiness Self-Assessment
RW	Radioactive Waste, as in DOE Office of RW
RWPC	Rolling Weather Protection Cover
SAD	Safety Assessment Document
SAR	Safety Analysis Report
SCD	Startup Criteria Document
SCDHEC	South Carolina Department of Health and Environmental Control
SEIS	Supplemental Environmental Impact Statement
SIMP	System Integration Management Plan
SMECT	Slurry Mix Evaporator Condensate Tank
SR	Savannah River - usually as a suffix to DOE
S/RID	Standards/Requirements Identification Document
SRS	Savannah River Site
SRTC	Savannah River Technology Center
ST	Sodium Titanate
STP	Site Treatment Plan
STPB	Sodium Tetraphenylborate
SW	Solid Waste
TBD	To Be Determined
TEC	Total Estimated Cost
TOST	Technical Oversite Steering Team
TPC	Total Project Cost
TSD	Treatment, Storage and Disposal
USQD	Unresolved Safety Question Determination
WM	Waste Management
WRP	Waste Removal Program
WSRC	Westinghouse Savannah River Company

HLW System Plan Revision 4 Addendum (U)

Pro Forma Funding and

System Attainment Analysis

HLW System Plan Revision 4
Addendum (U)
Pro Forma Funding and System Attainment Analysis

Table of Contents

Introduction

This pro forma funding and system attainment addendum to the HLW System Plan provides a sensitivity analysis to determine the program improvement or degradation that occurs at different levels of funding. This analysis should be utilized as a basis for making funding decisions in the future.

Five different cases have been developed which bound the HLW System. This pro forma funding addendum highlights the total program life cycle cost at five funding levels. In each case, the canister production fill rate is calculated, the program completion date is determined, and total cost is projected.

Historical Perspective

In the last several years, funding for the High Level Waste program at the SRS has been significantly reduced. The comparable funding table shown below displays the funding by year and in cumulative for the seven year period from FY94 to FY00. In the two years since the FY95 Five Year Plan (95 FYP) was submitted, a total of $824 million (approximately 18% from the 95 FYP) has been reduced. This has had a major negative impact on the overall success expectations for the HLW program.

Comparative Funding Table (Millions of Dollars)

	FY94	FY95	FY96	FY97	FY98	FY99	FY00	Cumulative FY94 - FY00	Funding Reduction
95 FYP	567	599	618	636	691	722	744	4,577	Baseline
96 FYP	543	581	552	562	573	585	596	3,992	-585
Projected	543	576*	494	509	524	540	556	3,730	-824

* Based on EW-31, 3161, Pension and Encumbrance Funding.

Projected Canister Production for each Funding Level

Funding Profile	Average Canisters/Year	Program Completion Date
95 FYP	404	2008
96 FYP	250	2018
Projected	231	2021

The critical impact to the program has been the slowdown in the canister production fill-rate at DWPF and a corresponding extension of the projected production completion date from FY 2008 in the 95 FYP to FY 2021 using the current projected funding level. With these funding reductions and extended program completion, the life cycle costs of the program have increased substantially.

Program Planning Basis

All of the cases were developed using the same program planning basis. The basis required that significant Productivity Improvement commitments be incorporated and previously planned startup reductions be implemented prior to allocating funding. Funding was then allocated based on the Priority list shown in Appendix L. This method of allocation maximized the funding provided to the Waste Removal and Replacement High Level Waste Evaporator Projects, thereby maximizing the attainment rate for the overall High Level Waste System. No funding was provided for emergent work activities. It was assumed that Reduction in Force approvals would be obtained in mid FY95 to support the reduced funding and staffing levels in Cases 2 - 5. An escalation rate of 3% was used in all funding calculations.

Productivity Improvement

A 20 % Productivity Improvement Commitment has been incorporated into each of the cases.

FY94 5% Reduction that has been accomplished.
FY95 5% Reduction that has been incorporated into the FY95 AOP.
FY96 4% Planned Manpower reduction
FY97 4% Planned Manpower reduction
FY98 2% Planned Manpower reduction

At this point in time, these commitments are a goal and the specific work practice improvements required to accomplish these savings have not been developed. However, it is anticipated that major changes in business methods will be required and implemented. These reductions cannot be made based on Level of Effort Reductions. Currently weekly meetings are being held to develop methods to accomplish the required FY96 Productivity Improvement goals.

Startup Reductions

The plan also incorporated the planned startup reductions. These reductions include the completion of TEC activities for the DWPF Project, the In-Tank Precipitation Project and the New Waste Transfer Project. It also includes a 7% reduction in High Level Waste Division staffing that was supporting startup activities.

No Funding for Emergent Work

The model did not provide contingency funding for emergent work activities. This planning basis was used to coincide with DOE budget guidance, however, the emergent work activities will occur. This model assumes that additional savings will be recognized to cover these emergent needs or that scope will be deferred as necessary when emergent activities are identified.

Reduction in Force
Due the combination of funding limitations, productivity improvements, and startup reductions, it should be anticipated that a Reduction in Force will be required for Cases 2-5. The approval of the Reduction in Force will need to be made in mid-FY95 to support the necessary 3161 notification requirements. Case 1 increases the overall scope and funding levels such that a Reduction in Force would not be required.

Summary of Results

Five different cases have been developed which bound the HLW System.

Case 1: Minimum Life Cycle Cost
The Minimum Life Cycle Cost Case was developed to model the best overall schedule and cost to achieve the earliest program completion. There were no Fiscal Year funding limitations placed on this case.

Case 2: Balanced Funding
The Balanced Funding Case was developed with a recognition that Fiscal Year funding limitations are a reality in the DOE Complex. Therefore, the funding levels were moderately constrained resulting in an increase in the overall Life Cycle Cost versus Case 1 while maintaining a good accomplishment rate for the program.

Case 3: Projected Funding
The Projected Funding Case was developed using the current funding guidance provided by DOE-HQ. This funding level results in a reduced production attainment for the program and significantly increases the life cycle cost versus Case 1 and 2.

Case 4: Reduced Funding
The Reduced Funding Case was developed to illustrate the impact of further funding reductions. Even relatively small additional funding reductions in the early years are very disruptive to the program and greatly increase the overall Life Cycle Cost. This is primarily due to delays in the waste removal and sludge processing required to prepare feed for DWPF.

Case 5: Maximum Life Cycle Cost
The Maximum Life Cycle Cost case was developed to provide a bounding case which would illustrate the lowest sustainable production rate for DWPF. This case pushes program completion out to 2066 results in an inappropriate expenditure of funds.

Summary of Five Cases

	Case 1:	Case 2:	Case 3:	Case 4:	Case 5:
Total Program Cost (billions)					
In Funding Year Dollars	11.2	13.1	17.3	32.9	99.8
In Constant Year Dollars (FY95)	8.7	9.8	11.8	17.6	30.4
Production					
Program Completion Date	2013	2015	2021	2035	2066
Average Canisters Filled/Year	340	292	231	145	81
Tank Age at Program End (years)					
Oldest Tank Age in Service	58	61	64	79	108
Average Tank Age	51	53	56	67	89
Unit Cost per Canister (millions)					
In Funding Year Dollars	2.0	2.3	3.0	5.8	17.7
In Constant Year Dollars (FY95)	1.5	1.7	2.1	3.1	5.4
Regulatory Impacts					
Regulatory Commitments	Met or Exceeded	Met or Exceeded	Met "Just in Time"	Not Met	Not Met

The funding requirements for the initial years of the program associated with each of the Cases are shown below. Note that relatively small funding increases in the early years have a dramatic impact on the final completion date and the resulting life cycle costs. This is because these additional dollars in the early years are critical to fund waste removal and sludge processing essential to supplying feed to the DWPF.

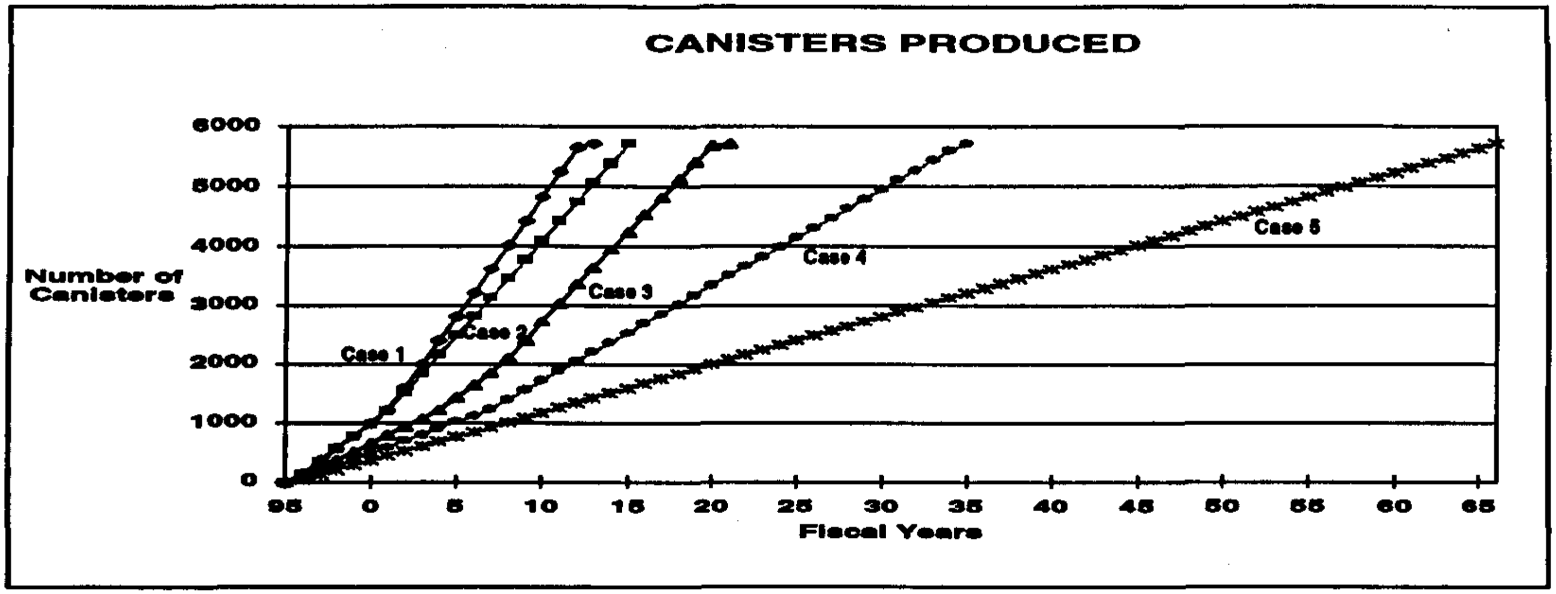
First 6-Years of Funding (Millions of Dollars)

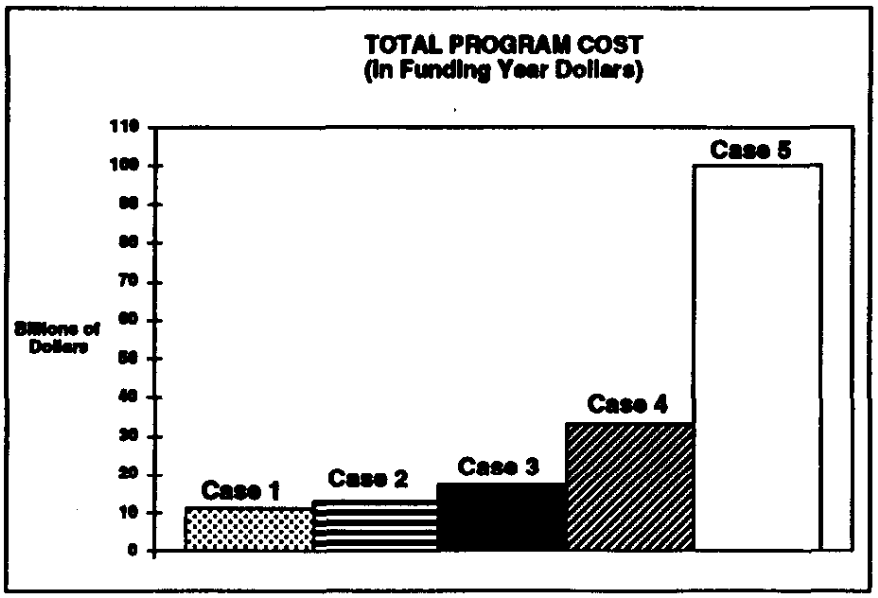
	Case 1: Minimum Life Cycle	**Case 2: Balanced Funding**	**Case 3: Projected Funding**	**Case 4 : Reduced Funding**	**Case 5: Maximum Life Cycle**
FY95*	576	576	576	576	576
FY96	530	518	494	488	484
FY97	536	538	509	496	477
FY98	550	541	524	501	486
FY99	574	561	540	515	509
FY00	602	568	556	522	507
TOTAL (6 years)	3,368	3,302	3,199	3,098	3,039

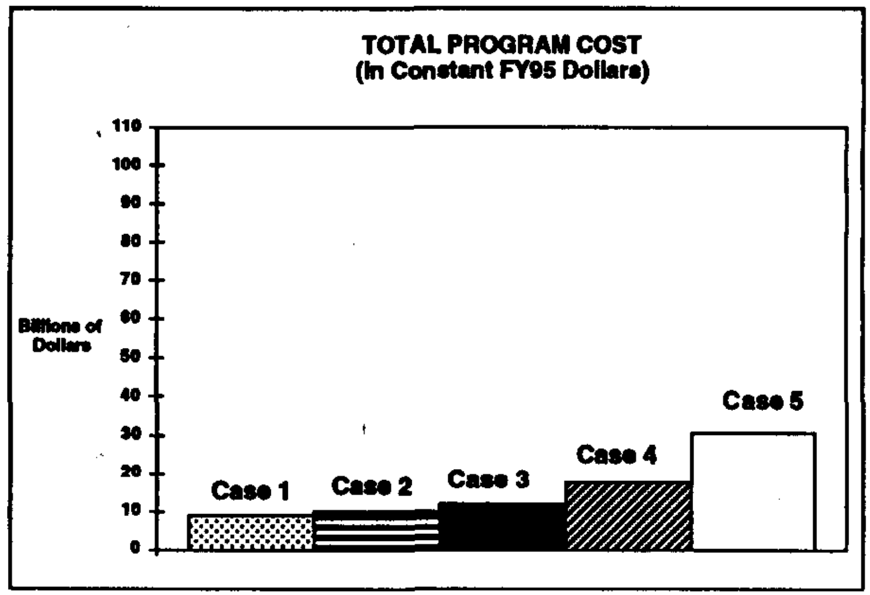
* Based on EW-31, 3161, Pension and Encumbrance Funding.

Figure 1 on the following page illustrates the Cumulative Canisters filled over the length of the program and the Total Program Cost in both Constant Year (FY95) and Funding Year Dollars for each of the Cases.

FIGURE 1: CASE COMPARISONS







Case Analysis

Case 1: Minimum Life Cycle Cost

The Minimum Life Cycle Cost Case was developed to approximate the best overall schedule and cost to achieve the earliest program completion. This Case was developed with no Fiscal Year funding limitations except for FY95. The Funding levels in FY96 and the outyears were determined based on providing the funding required to maximize the attainment of the High Level Waste System which in turn minimizes the Life Cycle cost and provides an earlier end date for the program. This case minimizes the age of the existing Tank Farm facilities at program completion, thereby minimizing the funding required for interim tank farm maintenance improvements and infrastructure replacements.

This case results in:

Total Program Cost (billions)*	
In Funding Year Dollars	11.2
In Constant Year Dollars (FY95)	8.7
Production	
Program Completion Date	2013
Average Canisters Filled/Year	340
Tank Age at Program End (years) **	
Oldest Tank Age in Service	58
Average Tank Age	51
Unit Cost per Canister (millions)	
In Funding Year Dollars	2.0
In Constant Year Dollars (FY95)	1.5
Regulatory Impacts	
Regulatory Commitments	Met or Exceeded

* All Total Program Costs (Life Cycle) are based on cost beginning with FY95. Prior Year sunk cost has not been included in the analysis.

** The Average /Oldest Tank Age is based on age of the Type I, II and IV Waste Tanks (which do not meet RCRA requirements) prior to the final Waste Removal actions being completed.

This case allows minimum maintenance/infrastructure improvements to be made because the program completion is accomplished in 2013. A listing of the required new projects to support this program is shown below. These projects include both upgrade and repetitive projects required for the program such as melters.

Project Title	FY Start	Project TEC in Millions of FY95 Dollars
Tank Farms		
Tank Farm Services Project	1996	19
Sample/Monitor System Upgrade	1997	10
Conversion of Salt Tanks	1997	11
ITP Benzene Abatement	1999	14
Storm Water Safeguards	2000	12
Tank Farm Support Services	2001	30
Document Control Facility	2002	3
Tank Farm Infrastructure Upgrades	2005	50
DWPF		
8 Saltstone Vaults	1996	144
6 Melters & Boxes	1997	123
2 Failed Equipment Storage Vaults (4 cells)	1998	8
DWPF Laboratory Upgrade for Attainment Improvement	1999	15
Salt Cell Benzene Abatement	1999	15
Glass Waste Storage Building II	1999	75
DWPF Infrastructure Upgrade I	2007	25
TOTAL		554

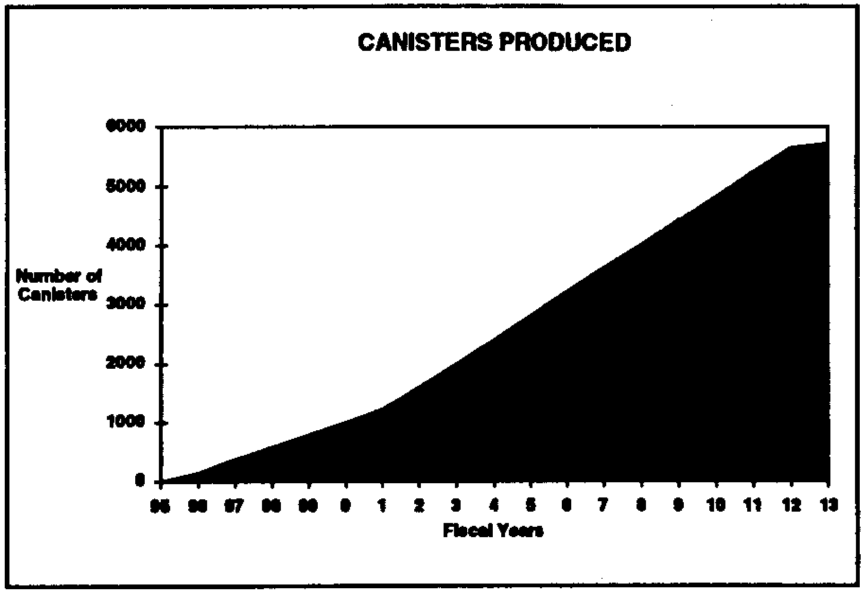
Figure 2 illustrates the Cumulative Canisters filled over the length of the program and the Total Program Cost in both Constant Year (FY95) and Funding Year Dollars for this Case. Table 1 provides a summary of the Production Plan for the case. The detailed cost estimate for the case on a year by year basis is provided in HLW-PMD-94-0031.

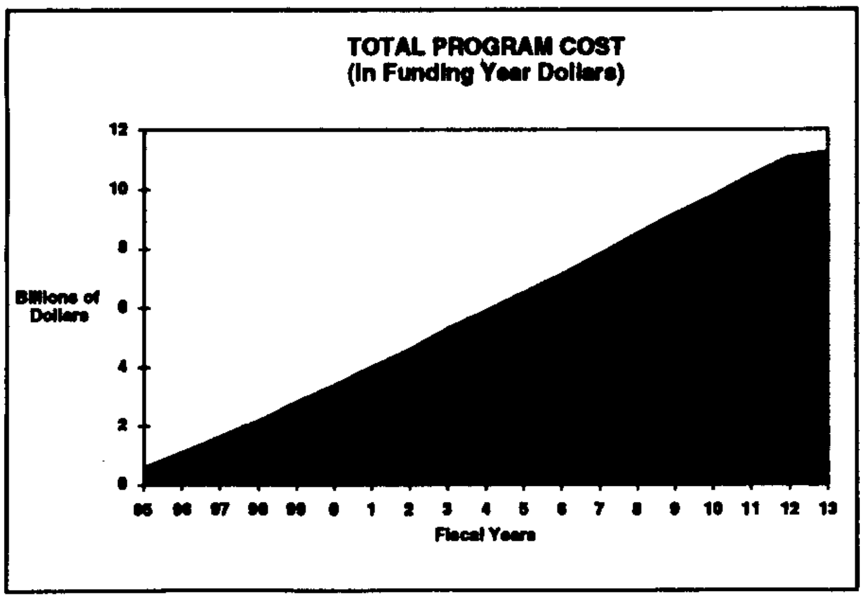
The funding profile to support this program is shown below.

Funding	$ Millions
Fiscal Year 1995*	576
Fiscal Year 1996	530
Fiscal Year 1997	536
Fiscal Year 1998	550
Fiscal Year 1999	574
Fiscal Year 2000	602

* Based on EW-31, 3161, Pension and Encumbrance Funding.

FIGURE 2
CASE I - MINUMUM LIFE CYCLE COST





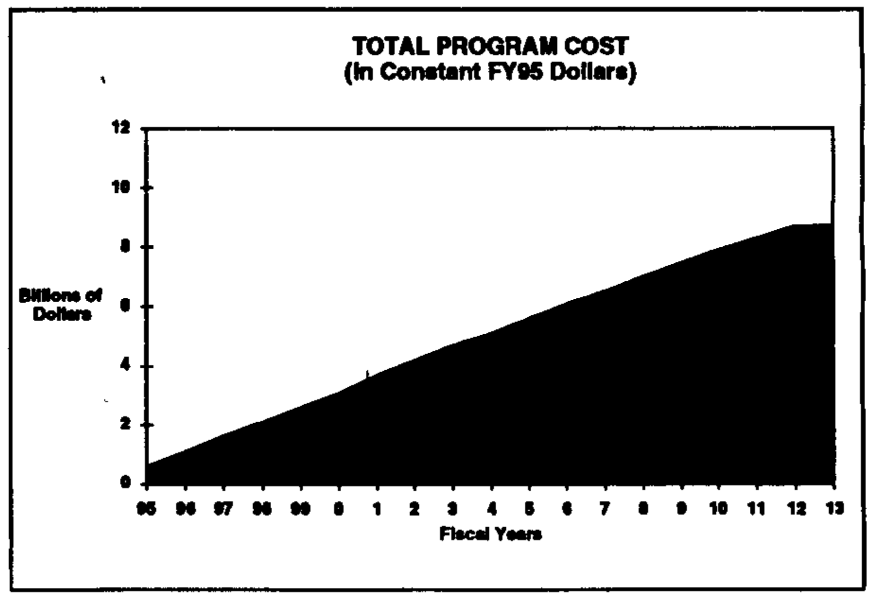


Table 1
Case 1 - Minimum Life Cycle Cost Production Plan

Batch	Start	Canisters	FY	Canisters	Cumulative Canisters	Sludge Tanks Removed from Service
1	3/1/96	1236				
			96	143	143	
			97	215	358	
			98	215	573	
			99	215	788	
			0	215	1003	
			1	215	1218	
2	12/1/01	782	2	373	1592	8,11,15
3	11/7/03	1513	3	405	1996	4,7,12,14,47
			4	405	2401	
			5	405	2806	
			6	405	3211	
4	8/3/07	971	7	405	3616	5,6,9,10,13,26,35
			8	405	4021	
			9	405	4426	
5	12/27/09	774	10	405	4832	1,2,3,32,33,34,39,43
			11	405	5237	
6	11/26/11	441	12	405	5641	17,18,19,21,22,23,24
			13	76	5717	

Case 2: Balanced Funding Profile

The Balanced Funding Case was developed with a recognition that Fiscal Year funding limitations are a reality in the DOE Complex. Therefore the funding levels were moderately constrained, resulting in an increase in the overall Life Cycle Cost while maintaining a good accomplishment rate for the program. This case provides a program that is sensitive to the age of the existing Tank Farm facilities at program completion, thereby reducing the funding required for maintenance improvements and infrastructure replacements.

This case results in:

Total Program Cost (billions)*	
In Funding Year Dollars	13.1
In Constant Year Dollars (FY95)	9.8
Production	
Program Completion Date	2015
Average Canisters Filled/Year	292
Tank Age at Program End (years)**	
Oldest Tank Age in Service	61
Average Tank Age	53
Unit Cost per Canister (millions)	
In Funding Year Dollars	2.3
In Constant Year Dollars (FY95)	1.7
Regulatory Impacts	
Regulatory Commitments	Met or Exceeded

* All Total Program Costs (Life Cycle) are based on cost beginning with FY95. Prior Year sunk cost has not been included in the analysis.

** The Average /Oldest Tank Age is based on age of the Type I, II and IV Waste Tanks (which do not meet RCRA requirements) prior to the final Waste Removal actions being completed.

This case allows limited maintenance/infrastructure improvements to be made because the program completion is accomplished in 2015. A listing of the required new projects to support this program is shown below. These projects include both upgrade and repetitive projects required for the program such as melters.

Project Title	FY Start	Project TEC in Millions of FY95 Dollars
Tank Farms		
Tank Farm Services Project	1996	19
Sample/Monitor System Upgrade	1997	10
Conversion of Salt Tanks	1997	11
ITP Benzene Abatement	1999	14
Storm Water Safeguards	2000	12
Tank Farm Support Services	2001	30
Document Control Facility	2002	3
Tank Farm Infrastructure Upgrades	2005	60
DWPF		
8 Saltstone Vaults	1996	144
7 Melters & Boxes	1997	143
2 Failed Equipment Storage Vaults (4 cells)	1998	8
DWPF Laboratory Upgrade for Attainment Improvement	1999	15
Salt Cell Benzene Abatement	1999	15
Glass Waste Storage Building II	2001	75
DWPF Infrastructure Upgrade I	2007	25
TOTAL		584

Figure 3 illustrates the Cumulative Canisters filled over the length of the program and the Total Program Cost in both Constant Year (FY95) and Funding Year Dollars for this Case. Table 2 provides a summary of the Production Plan for the case. The detailed cost estimate for the case on a year by year basis is provided in HLW-PMD-94-0031.

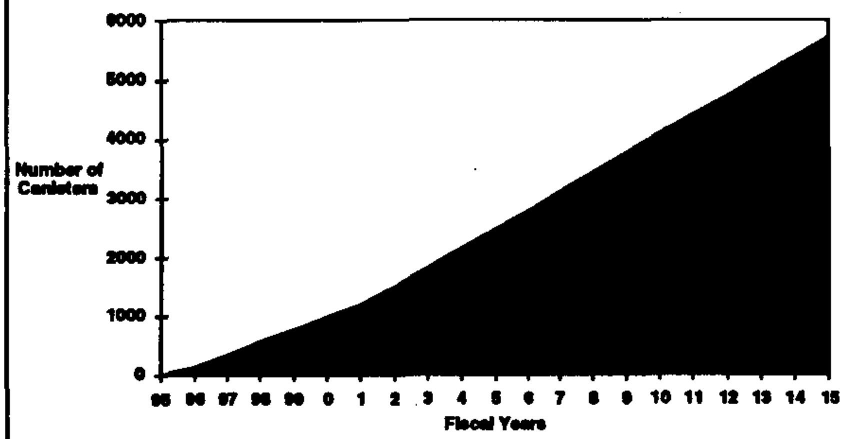
The FY95 funding level is consistent with the AOP. The Funding levels in FY96 and the outyears were determined based on less aggressive Fiscal Year funding requirements than Case I. The required funding profile to support this program is shown below.

Funding	$ Millions
Fiscal Year 1995*	576
Fiscal Year 1996	518
Fiscal Year 1997	538
Fiscal Year 1998	541
Fiscal Year 1999	561
Fiscal Year 2000	568

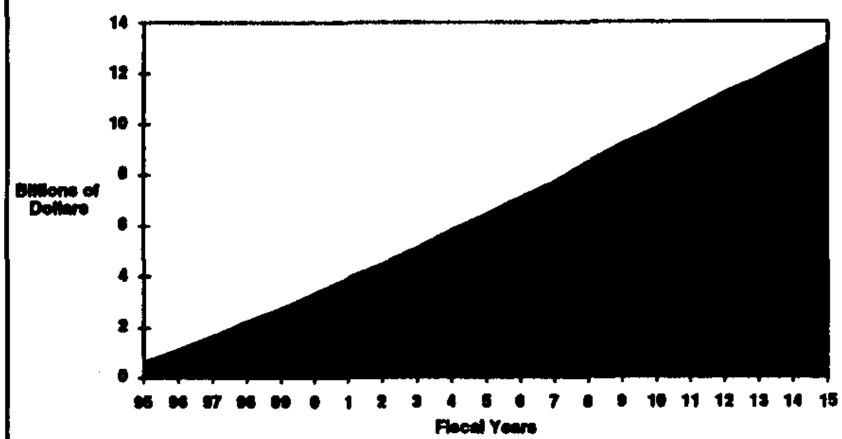
* Based on EW-31, 3161, Pension and Encumbrance Funding.

FIGURE 3
CASE 2 - BALANCED FUNDING

CANISTERS PRODUCED



TOTAL PROGRAM COST
(In Funding Year Dollars)



TOTAL PROGRAM COST
(In Constant FY95 Dollars)

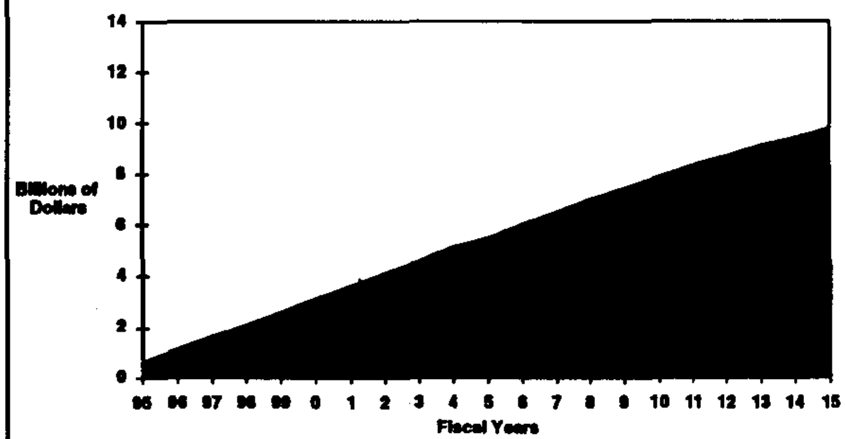


Table 2:
Case 2 - Balanced Funding Production Plan

Batch	Start	Canisters	FY	Canisters	Cumulative Canisters	Sludge Tanks Removed from Service
1	3/1/96	1236				
			96	125	125	
			97	215	340	
			98	215	555	
			99	215	770	
			0	215	985	
			1	215	1200	
2	12/1/01	782	2	306	1507	8,11,15
			3	324	1831	
3	5/1/04	1513	4	324	2155	4,7,12,14,47
			5	324	2479	
			6	324	2803	
			7	324	3127	
			8	324	3451	
4	1/2/09	971	9	324	3774	5,6,9,10,13,26,35
			10	324	4098	
			11	324	4422	
5	1/2/12	774	12	324	4745	1,2,3,32,33,34,39,43
			13	324	5069	
6	5/25/14	441	14	324	5393	17,18,19,21,22,23,24
			15	324	5717	

Case 3: Projected Funding Level

The Projected Funding Level Case was developed using the current funding guidance provided by DOE-HQ. This funding level results in a reduced production attainment for the program and significantly increases the life cycle cost versus Case 1 and 2. This case provides a program that is sensitive to the age of the existing Tank Farm facilities at program completion, thereby reducing the funding required for maintenance improvements and infrastructure replacements.

This case results in:

Total Program Cost (billions)*	
In Funding Year Dollars	17.3
In Constant Year Dollars (FY95)	11.8
Production	
Program Completion Date	2021
Average Canisters Filled/Year	231
Tank Age at Program End (years) **	
Oldest Tank Age in Service	64
Average Tank Age	56
Unit Cost per Canister (millions)	
In Funding Year Dollars	3.0
In Constant Year Dollars (FY95)	2.1
Regulatory Impacts	
Regulatory Commitments	Met "Just in Time"

* All Total Program Costs (Life Cycle) are based on cost beginning with FY95. Prior Year sunk cost has not been included in the analysis.

** The Average /Oldest Tank Age is based on age of the Type I, II and IV Waste Tanks (which do not meet RCRA requirements) prior to the final Waste Removal actions being completed.

This case requires an increased maintenance/infrastructure improvements versus Case 1 and 2 because the program completion is accomplished in 2021. A listing of the required new projects to support this program is shown below. These projects include both upgrade and repetitive projects required for the program such as melters.

Project Title	FY Start	Project TEC in Millions of FY95 Dollars
Tank Farms		
Tank Farm Services Project	1996	19
Sample/Monitor System Upgrade	1997	10
Conversion of Salt Tanks	1997	11
ITP Benzene Abatement	1999	14
Storm Water Safeguards	2000	12
Tank Farm Support Services	2001	30
Document Control Facility	2002	3
Tank Farm Infrastructure Upgrades	2006	70
DWPF		
8 Saltstone Vaults	1996	144
10 Melters & Boxes	1997	204
2.5 Failed Equipment Storage Vaults (4 cells)	1998	11
Salt Cell Benzene Abatement	1999	15
DWPF Laboratory Upgrade for Attainment Improvement	2002	15
Glass Waste Storage Building II	2002	75
DWPF Infrastructure Upgrade I	2007	25
TOTAL		658

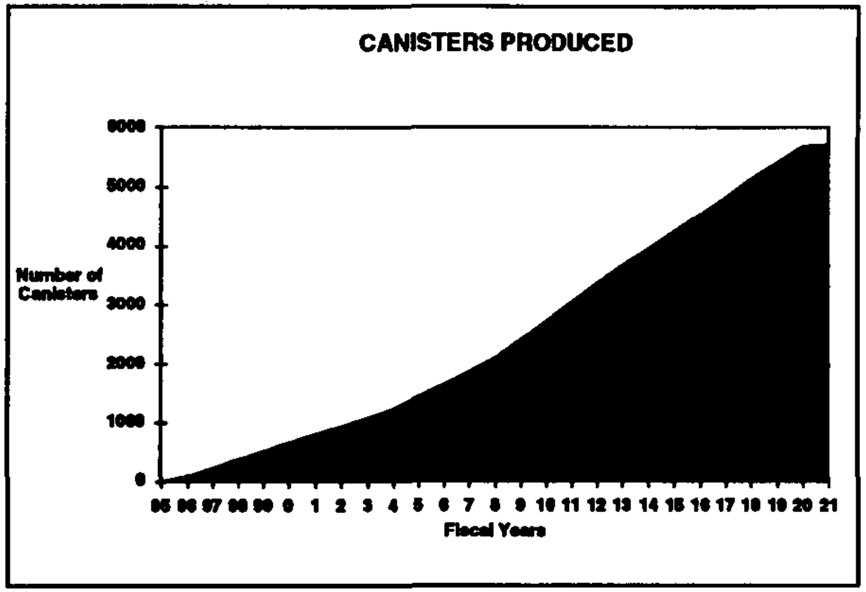
Figure 4 illustrates the Cumulative Canisters filled over the length of the program and the Total Program Cost in both Constant Year (FY95) and Funding Year Dollars for this Case. Table 3 provides a summary of the Production Plan for this case. The detailed cost estimate for the case on a year by year basis is provided in HLW-PMD-94-0031.

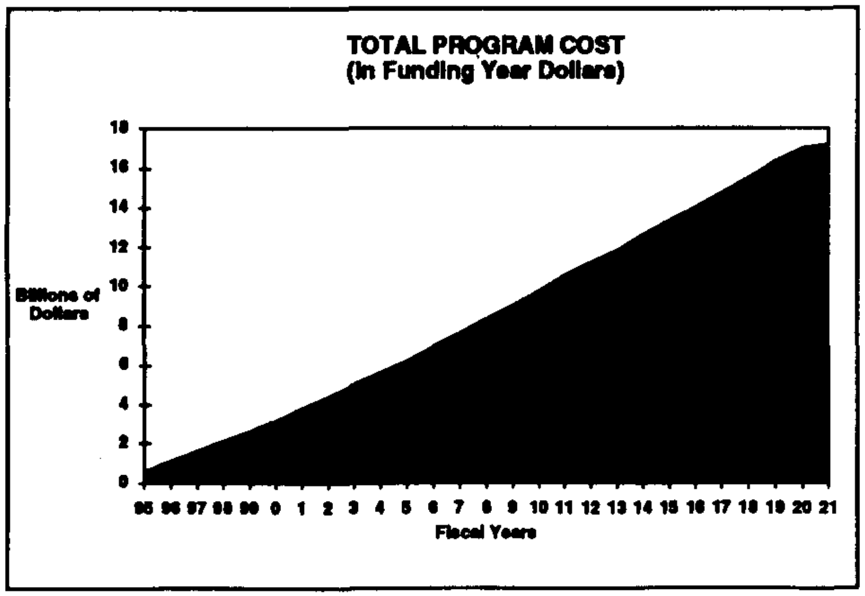
The funding profile to support this program is shown below.

Funding	$ Millions
Fiscal Year 1995*	576
Fiscal Year 1996	494
Fiscal Year 1997	509
Fiscal Year 1998	524
Fiscal Year 1999	540
Fiscal Year 2000	556

* Based on EW-31, 3161, Pension and Encumbrance Funding.

FIGURE 4
CASE 3 - PROJECTED FUNDING





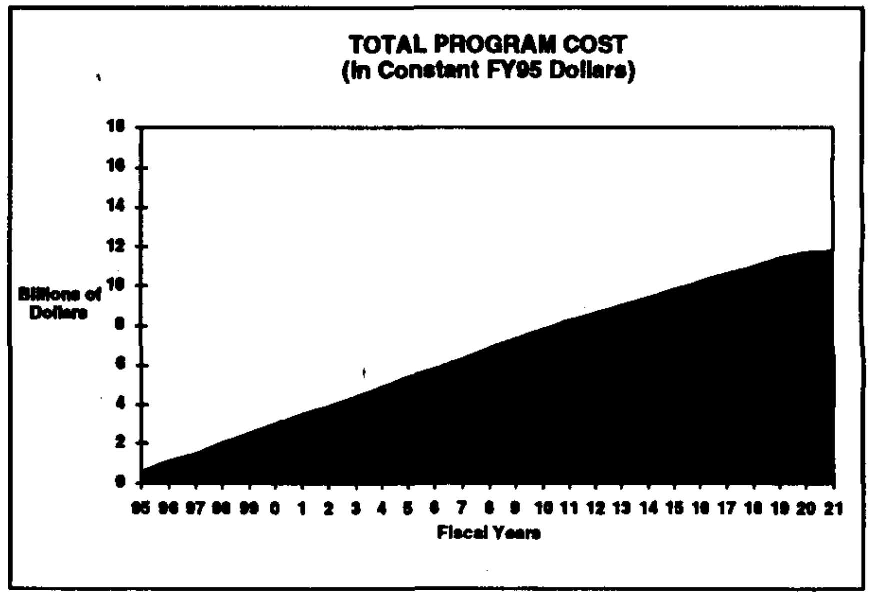


Table 3:
Case 3 - Projected Funding Production Plan

Batch	Start	Canisters	FY	Canisters	Cumulative Canisters	Sludge Tanks Removed from Service
1	3/1/96	1236				
			96	83	83	
			97	143	226	
			98	143	368	
			99	143	511	
			0	143	653	
			1	143	796	
			2	143	939	
			3	143	1081	
			4	143	1224	
2	11/4/04	782	5	207	1431	8,11,15
			6	213	1644	
			7	213	1857	
3	7/1/08	1513	8	238	2095	4,7,12,14,47
			9	313	2408	
			10	313	2722	
			11	313	3035	
			12	313	3348	
4	5/11/13	971	13	304	3652	5,6,9,10,13,26,35
			14	292	3944	
			15	292	4236	
5	9/14/17	774	16	292	4527	1,2,3,32,33,34,39,43
			17	300	4827	
			18	300	5127	
6	4/17/19	441	19	285	5412	17,18,19,21,22,23,24
			20	264	5676	
			21	41	5717	

Case 4: Reduced Funding Level

The Reduced Funding Level Case was developed to illustrate the impact of further funding reductions. Even relatively small additional funding reductions in the early years are very disruptive to the program and greatly increase the overall Life Cycle Cost. This is primarily due to delays in the Waste Removal Project and sludge batches required to prepare feed for DWPF.

This case is not sensitive to the age of the existing Tank Farm facilities at program completion, thereby substantially increasing the safety risk of the program and the funding required for maintenance improvements and infrastructure replacements. In this case, some tanks and support systems in the Tank Farms will be over 79 years old before the waste is removed. Many of these tanks do not meet RCRA secondary containment requirements. Therefore, if failures occur prior to Waste Removal, completion High Level Waste could potentially be released to the environment. This case will not meet Regulatory Commitments in the Federal Facility Agreement.

This case results in:

Total Program Cost (billions)	
In Funding Year Dollars	32.9
In Constant Year Dollars (FY95)	17.6
Production	
Program Completion Date	2035
Average Canisters Filled/Year	145
Tank Age at Program End (years) **	
Oldest Tank Age in Service	79
Average Tank Age	67
Unit Cost per Canister (millions)	
In Funding Year Dollars	5.8
In Constant Year Dollars (FY95)	3.1
Regulatory Impacts	
Regulatory Commitments	Not Met

* All Total Program Costs (Life Cycle) are based on cost beginning with FY95. Prior Year sunk cost has not been included in the analysis.

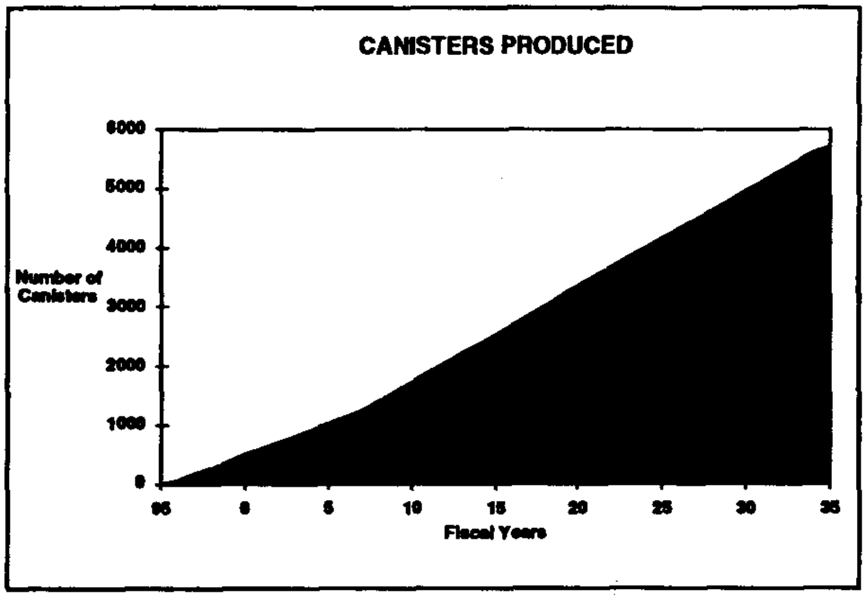
** The Average /Oldest Tank Age is based on age of the Type I, II and IV Waste Tanks (which do not meet RCRA requirements) prior to the final Waste Removal actions being completed.

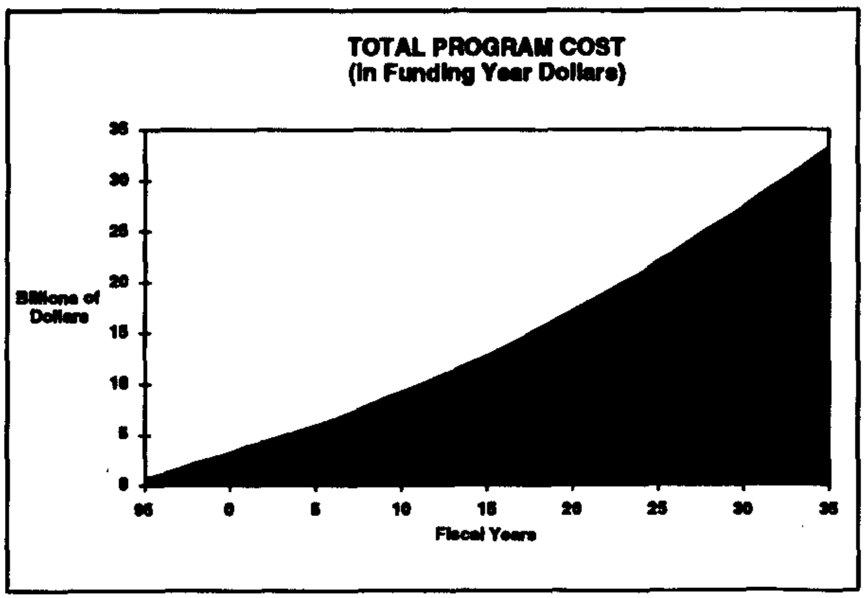
This case requires extensive maintenance/infrastructure improvements to be made because the program completion is not accomplished until 2035. This late completion date substantially extends age of the Tank Farm and DWPF facilities. A listing of the required new projects to support this program is shown below. These projects include both upgrade and repetitive projects required for the program such as melters.

Project Title	FY Start	Project TEC in Millions of FY95 Dollars
Tank Farms		
Tank Farm Services Project	1996	19
Sample/Monitor System Upgrade	1997	10
Conversion of Salt Tanks	1997	11
ITP Benzene Abatement	1999	14
Storm Water Safeguards	2000	12
Tank Farm Support Services	2001	30
Document Control Facility	2002	3
Tank Farm Infrastructure Upgtades I	2005	70
Tank Farm Infrastructure Upgrades II	2016	100
Ion Exchange replacement for ITP	2016	150
DWPF		
8 Saltstone Vaults	1996	144
15 Melters & Boxes	1997	306
4 Failed Equipment Storage Vaults (4 cells)	1998	16.8
Salt Cell Benzene Abatement	1999	15
DWPF Infrastructure Upgrade I	2007	25
Glass Waste Storage Building II	2007	75
DWPF Infrastructure Upgrade II	2025	75
TOTAL		1,076

Figure 5 illustrates the Cumulative Canisters filled over the length of the program and the Total Program Cost in both Constant Year (FY95) and Funding Year Dollars for this Case. Table 4 provides a summary of the Production Plan for the case. The detailed cost estimate for the case on a year by year basis is provided in HLW-PMD-94-0031.

FIGURE 5
CASE 4 - REDUCED FUNDING





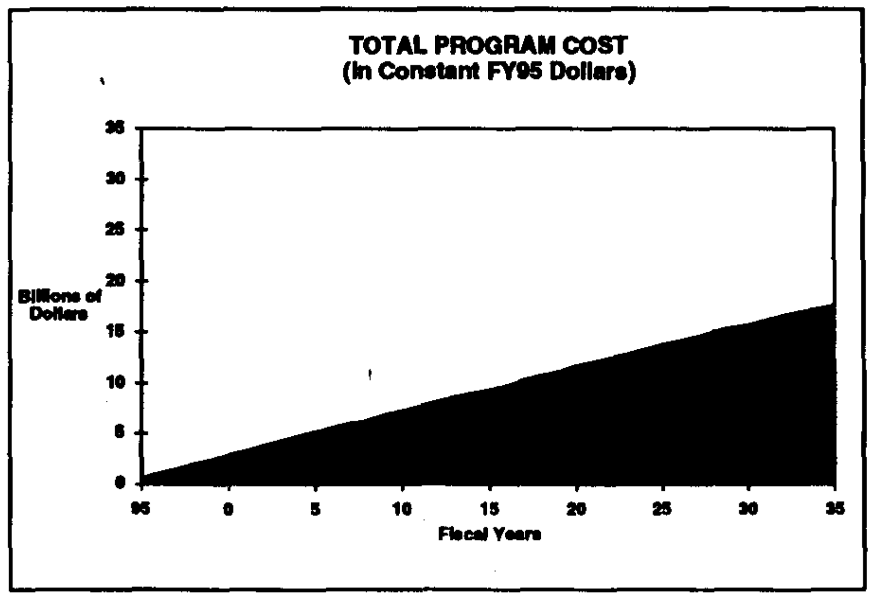


Table 4:
Case 4 - Reduced Funding Production Plan

Batch	Start	Canisters	FY	Canisters	Cumulative Canisters	Sludge Tanks Removed from Service
1	3/1/96	1236				
			96	62	62	
			97	107	169	
			98	107	276	
			99	107	382	
			0	107	489	
			1	107	596	
			2	107	703	
			3	107	809	
			4	107	916	
			5	107	1023	
			6	107	1130	
			7	107	1236	
2	10/18/07	782	8	160	1396	8,11,15
			9	162	1558	
			10	162	1720	
			11	162	1882	
3	8/16/12	1513	12	162	2044	4,7,12,14,47
			13	162	2206	
			14	162	2368	
			15	162	2530	
			16	162	2692	
			17	162	2854	
			18	162	3016	
			19	162	3178	
			20	162	3340	
			21	162	3502	
4	12/20/21	971	22	162	3664	5,6,9,10,13,26,35
			23	162	3826	
			24	162	3988	
			25	162	4150	
			26	162	4312	
			27	162	4474	
5	12/19/27	774	28	162	4636	1,2,3,32,33,34,39,43
			29	162	4798	
			30	162	4960	
			31	162	5122	
			32	162	5284	
6	9/29/32	441	33	162	5446	17,18,19,21,22,23,24
			34	162	5608	
			35	109	5717	

The required funding profile for the initial years to support this program is shown below.

Funding	$ Millions
Fiscal Year 1995*	576
Fiscal Year 1996	488
Fiscal Year 1997	496
Fiscal Year 1998	501
Fiscal Year 1999	515
Fiscal Year 2000	522

* Based on EW-31, 3161, Pension and Encumbrance Funding.

Case 5: Maximum Life Cycle Cost
The Maximum Life Cycle Cost case was developed to provide a case which would illustrate the lowest sustainable production rate for DWPF. This case which pushes program completion out to 2066 and results in an inappropriate expenditure of funds. This case is provided as a bounding case only.

The funding reductions in this case are very disruptive to the program and greatly increase the overall Life Cycle Cost. The reduced funding profile requires the whole High Level Waste System to function in a very inefficient and wasteful manner.

This case stretches the age of the existing Tank Farm facilities to over 100 years. This case would appear to result in an unacceptable increase in the safety risk of the program. Greatly increased funding would be required for maintenance improvements and infrastructure replacements. In this case, some tanks and support systems in the Tank Farms will be over 108 years old before High Level Waste can be removed. Many of these tanks do not meet RCRA secondary containment requirements, therefore if failures occur prior to Waste Removal completion High Level Waste could potentially be released to the environment. This case will not meet Regulatory Commitments in the Federal Facility Agreement.

This case results in:

Total Program Cost (billions)	
In Funding Year Dollars	99.8
In Constant Year Dollars (FY95)	30.4
Production	
Program Completion Date	2066
Average Canisters Filled/Year	81
Tank Age at Program End (years)**	
Oldest Tank Age in Service	108
Average Tank Age	89
Unit Cost per Canister (millions)	
In Funding Year Dollars	17.7
In Constant Year Dollars (FY95)	5.4
Regulatory Impacts	
Regulatory Commitments	Not Met

* All Total Program Costs (Life Cycle) are based on cost beginning with FY95. Prior Year sunk cost has not been included in the analysis.

** The Average /Oldest Tank Age is based on age of the Type I, II and IV Waste Tanks (which do not meet RCRA requirements) prior to the final Waste Removal actions being completed.

This case requires extensive maintenance/infrastructure improvements to be made because the program completion is not accomplished until 2066. This late completion date substantially extends age of the Tank Farm and DWPF facilities. Due to the significant concern about leaking waste tanks, four additional Type III tanks have been constructed to provide emergency replacement tanks for the program. A listing of the required new projects to support this program is shown below. These projects include both upgrade and repetitive projects required for the program such as melters.

Project Title	FY Start	Cost in Millions of FY95 Dollars
Tank Farms		
Tank Farm Services Project	1996	19
Sample/Monitor System Upgrade	1997	10
Conversion of Salt Tanks	1997	11
ITP Benzene Abatement	1999	14
Storm Water Safeguards	2000	12
Tank Farm Support Services	2001	30
Document Control Facility	2002	3
Tank Farm Infrastructure Upgrades I	2006	70
Ion Exchange replacement for ITP	2016	150
Tank Farm Infrastructure Upgrades II	2018	100
4 New Type III Waste Tanks	2020	320
DWPF		
8 Saltstone Vaults	1996	144
28 Melters & Boxes	1997	571
7 Failed Equipment Storage Vaults (4 cells)	1998	30
Salt Cell Benzene Abatement	1999	15
DWPF Infrastructure Upgrade I	2007	25
Glass Waste Storage Building II	2019	75
DWPF Infrastructure Upgrade I	2025	75
DWPF Infrastructure Upgrade II	2035	100
TOTAL		1,624

Figure 6 illustrates the Cumulative Canisters filled over the length of the program and the Total Program Cost in both Constant Year (FY95) and Funding Year Dollars for this Case. Table 5 provides a summary of the Production Plan for the case. The detailed cost estimate for the case on a year by year basis is provided in HLW-PMD-94-0031.

FIGURE 6
CASE 5 - MAXIMUM LIFE CYCLE COST

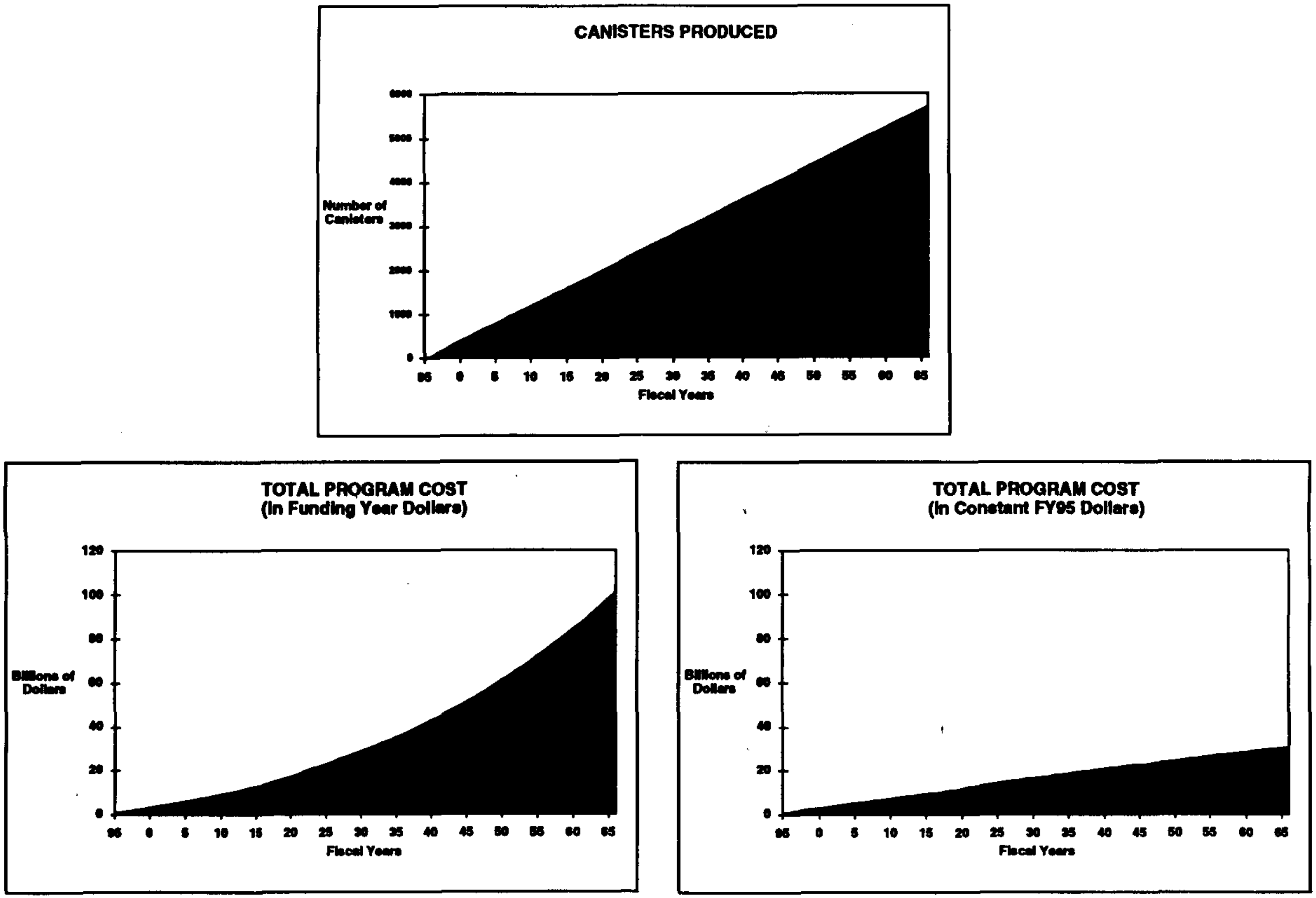


Table 5:
Case 5 - Maximum Life Cycle Cost Production Plan

Batch	Start	Canisters	FY	Canisters	Cumulative Canisters	Sludge Tanks Removed from Service
1	3/1/96	1236				
			96	47	47	
			97	81	128	
			98	81	209	
			99	81	290	
			0	81	371	
			1	81	452	
			2	81	533	
			3	81	614	
			4	81	695	
			5	81	776	
			6	81	857	
			7	81	938	
			8	81	1019	
			9	81	1100	
			10	81	1181	
2	6/5/11	782	11	81	1262	8,11,15
			12	81	1343	
			13	81	1424	
			14	81	1505	
			15	81	1586	
			16	81	1667	
			17	81	1748	
			18	81	1829	
			19	81	1910	
			20	81	1992	
3	1/30/21	1513	21	81	2073	4,7,12,14,47
			22	81	2154	
			23	81	2235	
			24	81	2316	
			25	81	2397	
			26	81	2478	
			27	81	2559	
			28	81	2640	
			29	81	2721	
			30	81	2801	
			31	81	2882	
			32	81	2963	
			33	81	3044	

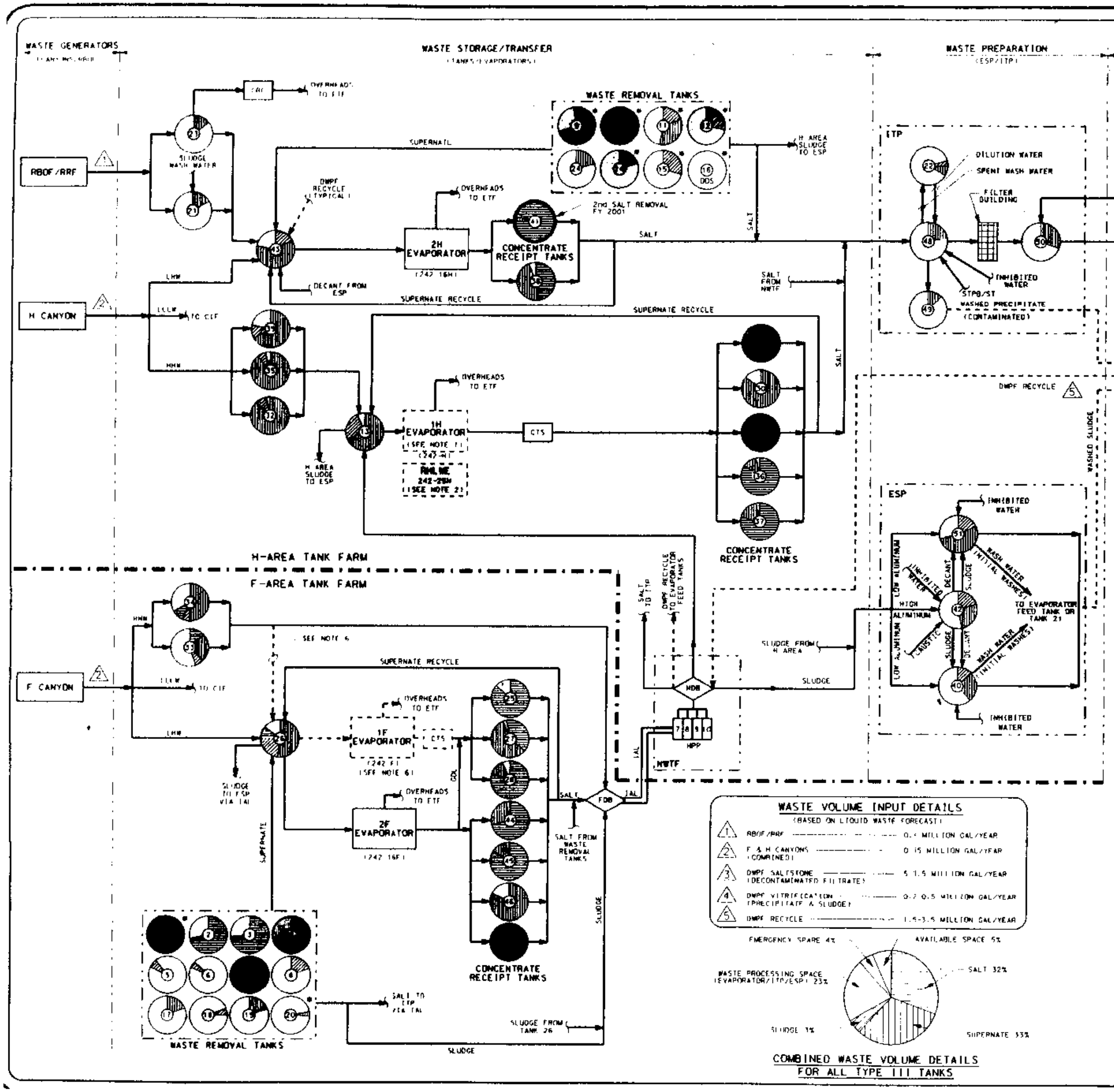
**Table 5:
Case 5 - Maximum Life Cycle Cost Production Plan**

Batch	Start	Canisters	FY	Canisters	Cumulative Canisters	Sludge Tanks
			34	81	3125	
			35	81	3206	
			36	81	3287	
			37	81	3368	
			38	81	3449	
			39	81	3530	
4	10/7/39	971	40	81	3611	5,6,9,10,13,26,35
			41	81	3692	
			42	81	3773	
			43	81	3854	
			44	81	3935	
			45	81	4016	
			46	81	4097	
			47	81	4178	
			48	81	4259	
			49	81	4340	
			50	81	4421	
			51	81	4502	
5	10/3/51	774	52	81	4583	1,2,3,32,33,34,39,43
			53	81	4664	
			54	81	4745	
			55	81	4826	
			56	81	4907	
			57	81	4988	
			58	81	5069	
			59	81	5150	
			60	81	5231	
6	4/24/61	441	61	81	5312	17,18,19,21,22,23,24
			62	81	5393	
			63	81	5474	
			64	81	5555	
			65	81	5636	
			66	81	5717	

The required funding profile to support this program is shown below.

Funding	$ Millions
Fiscal Year 1995*	576
Fiscal Year 1996	484
Fiscal Year 1997	477
Fiscal Year 1998	486
Fiscal Year 1999	509
Fiscal Year 2000	507

* Based on EW-31, 3161, Pension and Encumbrance Funding.



NOTE
Use this flow diagram for INFORMATION only.

FY 95	FY 96	FY 97	FY 98	FY 99	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	FY 2006	FY 2007	FY 2008 AND BEYOND

1. COLOR CODE SHOWS START OF WASTE REMOVAL/OPERATION BY FISCAL YEARS BASED ON HIGH LEVEL WASTE SYSTEM PLAN. PROGRAM SCHEDULE. REV. 3.
2. THIS DIAGRAM DOES NOT INCLUDE SUPPORT FACILITIES SUCH AS CONTROL ROOM, DCS, AND INFRA STRUCTURE.

LEGEND

CIF	CONSOLIDATED INCINERATION FACILITY
CRC	CESIUM REMOVAL COLUMNS
CTS	CONCENTRATE TRANSFER SYSTEM
DWPF	DEFENSE WASTE PROCESSING FACILITY
ESP	EXTENDED SLUDGE PROCESSING
FDB	F AREA DIVERSION BOX
GDL	GRAVITY DRAIN LINE
HDB	H AREA DIVERSION BOX
HHW	HIGH HEAT WASTE
HPP	PUMP PIT (H AREA)
IAL	INTER-AREA LINE
ITP	IN TANK PRECIPITATION
LHW	LOW HEAT WASTE
LLLW	LIQUID LOW LEVEL WASTE
NWTF	NEW WASTE TRANSFER FACILITY
OOS	OUT OF SERVICE
RBOF	RECEIVING BASIN FOR OFFSITE FUEL
RHLWE	REPLACEMENT HIGH LEVEL WASTE EVAPORATOR
RRF	RESIN REGENERATION FACILITY
ST	SODIUM TITANATE
STPB	SODIUM TETRA PHENYL BORATE

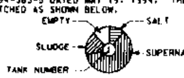
TANK FARMS

TYPE OF TANK	TANK NO.S	AREA
TYPE I TANK (720,000 GALLONS)	1-8	F AREA
	9-12	H AREA
TYPE II TANK (1,030,000 GALLONS)	13-16	H AREA
TYPE III TANK (1,300,000 GALLONS)	25-28	F AREA
	29-32	H AREA
	33-34	F AREA
	35-43	H AREA
	44-47	F AREA
	48-51	H AREA
TYPE IV TANK (1,300,000 GALLONS)	17-20	F AREA
	21-24	H AREA

● TANKS WITH CRACKS

GENERAL NOTES

1. DOTTED LINE SHOWS FACILITY OR PROCESSES CURRENTLY NOT IN OPERATION.
2. WHEN REPLACEMENT HIGH LEVEL WASTE EVAPORATOR IS PLACED IN SERVICE, TANK 32 WILL BECOME THE FEED TANK AND 1H EVAPORATOR AND TANK 13 WILL BE TAKEN OUT OF SERVICE. FURTHER, TANKS 35 AND 36 WILL SWITCH FUNCTIONS.
3. IT IS WASTE MANAGEMENT'S OBJECTIVE TO EMPTY ALL TYPE I, II, & IV TANKS AND REMOVE THEM OUT OF SERVICE AS EARLY AS POSSIBLE.
4. THERE ARE MANY DIVERSION BOXES NOT SHOWN HERE WHICH HELP TO ROUTE WASTE TO VARIOUS TANKS TO COPE WITH THE LEVEL AND TYPE OF WASTE IN THE TANKS.
5. WASTE CONTENTS ARE SHOWN BY COLORED SEGMENTS PROPORTIONAL FOR EACH TANK ACCORDING TO ITS INDIVIDUAL OPERATING LIMIT, EXCEPT FOR WASTE REMOVAL TANKS (TANKS 1-12, 14-20, AND 24) WHICH ARE SHOWN ACCORDING TO THEIR MAXIMUM FILL LIMITS. THE DATA IS BASED ON HIGH LEVEL WASTE ENGINEERING RECORD WSRC-RP-94-303-5 DATED MAY 19, 1994. THE CONTENTS ARE COLOR HATCHED AS SHOWN BELOW.



6. F-AREA WILL BE PROCESSING HIGH HEAT WASTE IN THE FUTURE, USING 2F EVAPORATOR; THE 1F EVAPORATOR IS INACTIVE.
7. 1H AND 1F EVAPORATORS ARE CURRENTLY OUT OF SERVICE.

HIGH LEVEL WASTE
WASTE REMOVAL BY FISCAL YEARS

DATE: NOVEMBER 15, 1994
PREPARED BY: ASOKA PILLAI
DRAWN BY: KAREN A. BARLEY

HLW-OVP-94-0145, HLW System Plan, Revision 4 (U), November 30, 1994

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L. G. Frelin, 703-H
G. L. Archer, 742-13G
M. T. Keefer, 241-153H
A. J. Norkus, 742-13G
T. E. Pate, 742-13G
K. Rashidi, 742-13G
C. J. Wooley, 742-13G

HLWM Controller
G. Kizer, 719-4A
P. S. Kennedy, 704-1S
T. Ross, 742-9G

HLWM E&CS
J. C. Woeber, 719-4A
G. M. Johnson, 703-5C
D. Matos, 742-8G
R. A. Stokes, 704-6C

HLWM ENRG
T. J. Lex, 719-4A
D. T. Bignell, 719-4A
R. C. Blaine, 704-15S
D. F. Brown, 703-H
R. M. Campbell, 719-4A
J. T. Carter, 704-25S
R. K. Cauthen, 704-15S
B. G. Croley, 241-120H
P. D. d'Entremont, 703-H
H. H. Elder, 704-S
G. K. Georgeton, 703-H
W. T. Goldston, 704-S
M. A. Hunter, 742-6G
W. D. Kimball, 704-S
B. L. Lewis, 703-8C
J. E. Marra, 703-H
S. L. Marra, 704-35S
M. S. Miller, 704-S
T. M. Monahon, 703-H
M. J. Montini, 704-S
J. P. Morin, 719-4A
J. F. Ortaldo, 704-S
P. Patel, 704-27S
R. L. Salizzoni, 707-H
R. M. Satterfield, 719-4A
C. B. Stevens, 742-6G
P. L. Rutland, 241-152H
W. Van Pelt, 241-152H

HLWM ITP
H. Handfinger, 704-56H
C. J. Baker, 704-56H

HLWM Ops
G. T. Wright, 703-H
J. W. French, 703-H
R. W. Wilson, 707-H
G. Davis, 241-100F
E. R. Losure, 707-H
A. W. Wiggins, 241-84H
C. A. Polson, 707-H

HLWMD QA
L. J. Wickas, 719-4A
M. K. Carlson, 704-S

HLWM Training
J. W. Smith, 705-1C
E. C. Temple, 705-C
D. Zimmerman, 704-49S

HLWM WRP
W. B. Boore, 703-8C
M. J. Green, 703-8C
J. E. Herbert, 703-9C
M. J. Mahoney, 703-8C

EDD
T. H. Gould, 773-41A

EPD Division
C. Hayes, 742-5A

NMPD
M. F. Sjuka, 703-A
R. L. Geddes, 704-F
W. R. McDonell, 773-41A
T. C. Robinson, 221-F

SRTC
E. W. Holtzscheiter, 773-A
W. L. Tamosaitis, 773-A
A. S. Choi, 704-1T
S. D. Fink, 773-A
R. A. Jacobs, 704-T
M. J. Plodinec, 773-A
A. A. Ramsey, 704-1T

SWER
C. B. Jones, 730-B
L. L. Bailey, 730-B
W. Carnes, 704-61S
S. E. Crook, 704-45S
B. A. Daugherty, 705-3C
R. T. Duke, 705-3C
S. A. Lorah, 704-45S
C. McVay, 704-45S
K. S. Wierzbicki, 730-B
K. Z. Wolf, 705-3C

WHC
P. Brackenbury
L. Ermold
K. Gasper
D. Richardson
D. Wodrich

WVNS
R. Lawrence
D. Meess